

NOVEMBER, 1923

# Railway Engineering and Maintenance

You Will Find  
DEPENDABLE RAIL ANTI-CREEPER  
on every piece of well-maintained  
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THE PENN. CO.

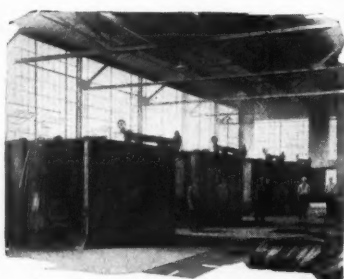
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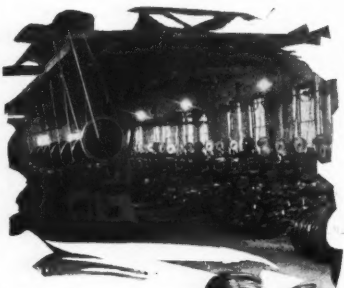
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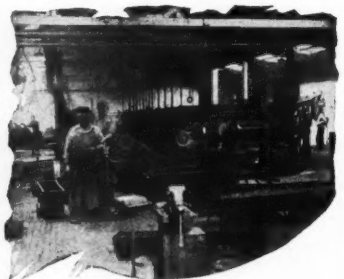
39 GROSSERD PL. N. Y. C.



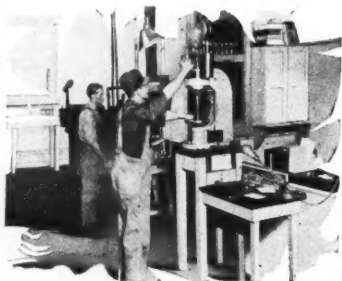
Furnaces in Reliance Steel Plant



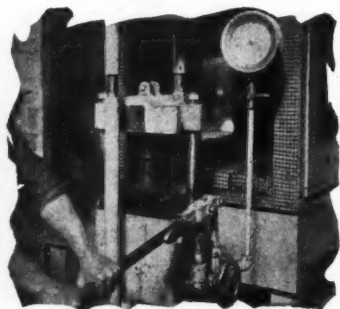
View in Forming Department



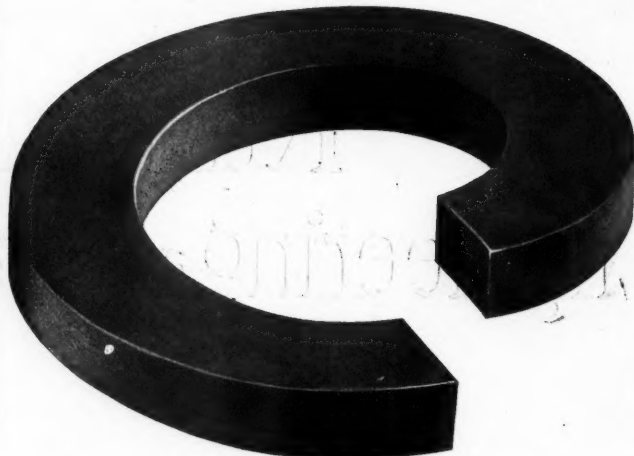
Heat Treating Department



Testing Laboratory



20-Ton Hydraulic Compression Test



**I**F YOU COULD WATCH the evolution of a Hy-Crome Nut Lock you would be surprised by the human skill and care, and the many intricate and exclusive mechanical processes involved in its production. One ceaseless round of vigilance to insure that every single Hy-Crome Nut Lock shall be fully capable of performing its designated duty and equally worthy of the name "Reliance."

☛ The result of this super care and unceasing watchfulness—of the unusual methods employed, is that Reliance Hy-Crome Nut Locks occupy the highest pinnacle of consistently reliable service—concrete evidence of the Power of an Ideal faithfully pursued.

### THE RELIANCE MFG. CO., Massillon, Ohio

Branch Offices: New York, Cleveland, Detroit, Chicago, St. Louis, San Francisco.

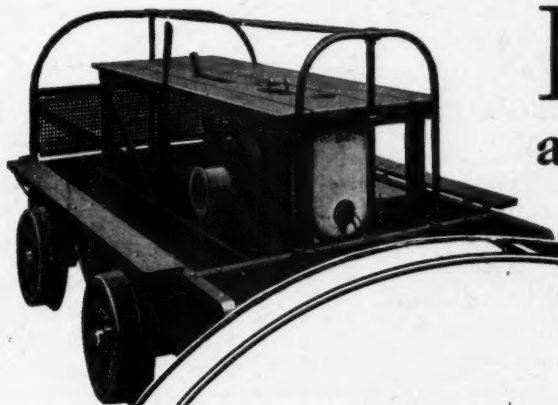
Distributors: Crerar Adams Co., Chicago; Bostwick-Braun Co., Toledo; W. and A. C. Semple, Louisville, Ky.; Keith, Simmons Co., Nashville, Tenn.; The Shapleigh Hardware Co., St. Louis.

Agents: Walker Draft Gear Co., New York; K. C. Banks Co., Los Angeles;

F. W. Cooper Engineering Materials, Ltd., Montreal, Canada.

# RELIANCE HY-CROME NUT LOCKS

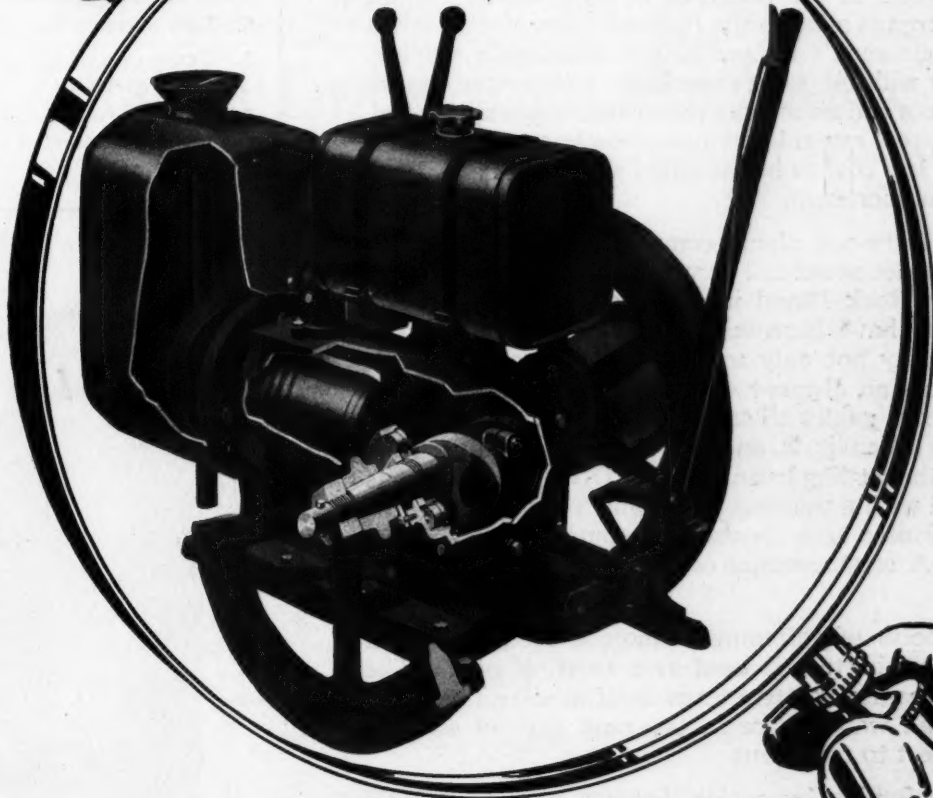
Keep Tight Joints TIGHT



# POWER

always in reserve

Rated at 8 H.P.  
Develops over  
10 H. P.



The versatility of the Mudge "All Service" (Class W. S. 1) Motor Car is due to its highly efficient power unit, the Mudge 8 H. P., 2-port, 2-cycle, water cooled, Roller Bearing Engine.

It is compact, occupying a space of 2 feet square by 3 feet long. It is comparatively light, weighing 285 pounds, it has over-size shafts, liberal bearing surfaces and therefor long life.

The reserve power possessed by this Mudge motor, makes the "All Service" suitable for heavy duty on bridge or extra gang, as well as for light section work.

The "All Service" "One car for all jobs," 3 men or 50.

## Mudge & Company

Manufacturers—Railroad Equipment  
Railway Exchange Bldg. • CHICAGO



## Savings of Softening Increased by use of *The HORTON* *Conical-bottom Tank*

A saving of five per cent of the total coal used is the conservative estimate attributed directly to water softening. Even though it never exceeded this percentage (it generally does) softening would be economically advisable in the majority of cases. But the additional savings, embracing seven other major features, certainly present a situation few railroad men will overlook.

Clean water in the boiler, or in other words a clean boiler itself, means a lot to the railroad—the effects extend from the engineman's temper to the company's surplus. The engineer will tell you a clean boiler lasts longer, breaks down less times and gives more power than the scaled boiler. The fireman, too, can enlighten you—he knows water softening means less coal to be shovelled and those hard, long, overtime runs shortened.

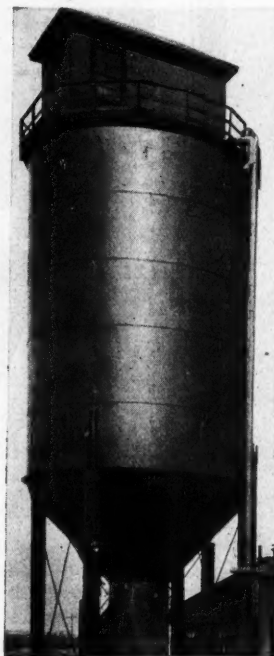
In 1919 forty-one plants comprising the second water softening district saved 182 percent on the original investment for the Rock Island in one year. Since that time Horton tanks have become popular as softening tanks. Their suitability not only makes treating more thorough but introduces an element of even greater saving. The Conical bottom guides all settling foreign matter into the mud drum. Then it is an easy matter to remove this sludge from the settling basin. HORTON Conical bottoms are equipped with a washout valve which may be operated for a few minutes each day without putting the tank out of service. A small amount of water flushes out all the sludge.

The process of softening is more thorough when a Horton conical bottom is used as a treating tank. The shape of the conical bottom lends itself to softening, there being no dead water space in the tank and all water is directly subject to treatment.

Water softening by engine districts with HORTON conical bottoms has become popular. The building of an ample number of systems with large capacities per hour and at frequent intervals have permitted roads to take advantage of the large savings. The principal roads of middle west have entered HORTON conical bottoms as a part of their water softening program. Have you taken advantage of water softening ideas our engineers have for you?

### Eight Savings by Water Softening

1. Less fuel consumed per ton mile.
2. Less Repairs of Boilers.
3. Fewer blowdowns of boilers.
4. Longer life of flues, fire boxes, et cetera.
5. Less delays and failures due to leaky flues and sheets.
6. Less overtime for crews.
7. Fewer cars set off with fewer trains given up.
8. Greater evaporation of water per pound of fuel consumed.



Standard 30,000 Gallon per hour  
Treating System Tank at  
Fort Wayne, Iowa.

Write us for tank quotations. You are not obligated.

# Chicago Bridge & Iron Works

CHICAGO  
2452 Transportation Bldg.

DALLAS  
1646 Praetorian Bldg.

SAN FRANCISCO  
1007 Rialto Bldg.

NEW YORK  
3156 Hudson Terminal Bldg.

ATLANTA  
1036 Healey Bldg.



Preparing for the Barbecue at the Union Pacific Rally at Omaha.

# Railway Engineering and Maintenance

Formerly the Railway Maintenance Engineer

Vol. 19

November, 1923

Number 11

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## WOULD YOU LIKE TO KNOW

How section foremen may be trained?  
How to keep water tank risers from freezing?  
What type of ballast trestle is easiest to repair?  
If painting can be done in winter?  
How to replace culverts under traffic?  
Answers to these and other practical questions  
will be found elsewhere in this issue.

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(Washington, D. C.)

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# 1 1/3 more per dollar

**D**U PONT Chemical Engineers have found a way to give you 1/3 more value for each dollar you spend for explosives.

Dumorite, the new du Pont dynamite, shoots stick for stick with 40% dynamite, but you get 135 to 140 sticks per case instead

of the usual 100— *at the same price.*

Write our nearest branch office, outlining your explosives requirements. Our Service Department will give you detailed information about Dumorite as it applies to your work.

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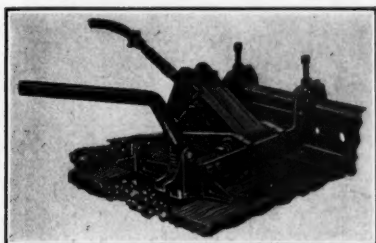
Delaware

**Branch Offices:**

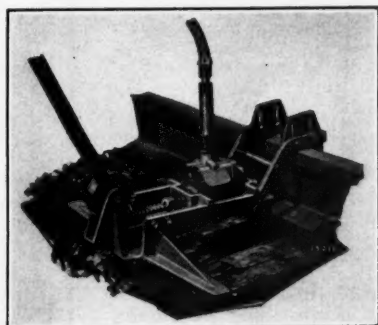
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Spokane, Wash.    Mexico City, Mexico  
Du Pont Products Exhibit,  
Atlantic City, N. J.

# Pneumatic Tie Tampers

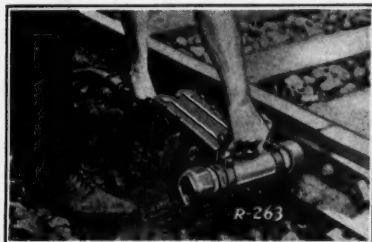
A few of the other labor-saving air tools used with Pneumatic Tamping Outfits.



No. 9 Ingersoll-Rand Rail Drill. Puts a  $\frac{1}{8}$ " hole through web in 25 sec.



Ingersoll-Rand Bonding Drill, No. 5. Averages 70- $\frac{1}{16}$ " holes per hr.



No. 19 Ingersoll-Rand Rail Bolter. Bolts a 6 hole joint in 1 min.



Ingersoll-Rand Grinder. Saves labor on all grinding and cleaning.



A 4 Tool Pneumatic Tamping Gang. Air Compressor in Background.

## Save Man-Power

### Use air operated labor-saving machines

Ingersoll-Rand Pneumatic tie tampers enable small gangs to equal the work output of large hand gangs and to make a smoother, safer and more permanent roadbed. Four men with pneumatic tampers will do as much work as 12 to 16 men hand tamping.

The tie tamper compressor car is also a convenient portable power plant for operating other air driven tools for track and maintenance work. Such tools as rail-bonding and rail drills, rail bolting drills, grinders, spike drivers, riveting, chipping and calking hammers, rock drills, wire brush cleaners and sand blast and paint spray.

A pneumatic tamping outfit enables pronounced savings to be made on a wide variety of operations. Ask us for further details on the many uses.

**INGERSOLL-RAND COMPANY, 11 Broadway, New York**

*Offices in all principal domestic and foreign cities*

For Canada refer Canadian Ingersoll-Rand Co., Limited,  
260 St. James St., Montreal

193TT

# Ingersoll-Rand

# International



## The Bright Spot in the Tie Industry

Yes—a very bright spot—and one which is setting the pace in the tie industry. Why? Because International is producing sound ties free from decay to start with, properly graded, with all grades indicated by permanent paint marks, and finally, all ties are permanently trade-marked with the I. C. C. Co. Dating Nail. Surely that's a big step forward and one bright spot where railroads are guaranteed high grade ties.

This step is a very important one—not only from the engineering standpoint, but from purchasing, inspection and distributing standpoints. When you order ties from the International Company you get the exact grade and timber which you specify. The grade is indicated with paint marks and the I. C. C. Co. Dating Nail proves the quality is there. Furthermore, International Ties are so carefully classified that shipments and distribution can be made very efficiently—often entirely eliminating the cost of rehandling and reshipping, which amounts to 10 to 15 cents per tie when the ties are not properly classified. Save this amount—also your entire line inspection costs, which amount to about 5 cents per tie. The accrued savings made possible by International Service will almost pay for treating the ties.

Prepare now by contracting for your ties for 1924 spring delivery.

### International Creosoting & Construction Co.

General Office—Galveston, Texas

Plants: Texarkana, Texas    Beaumont, Texas  
Galveston, Texas





Section Car—M2

Performance  
on the Job  
Counts

# No Wasted Man-hours

Every morning tens of thousands of Fairmont Motor Cars are started out for the day's work by tens of thousands of section foremen and are started out *promptly*.

A check up of man-hours lost on account of the motor car refusing to run will reveal that the smallest percentage of loss is chargeable to Fairmont equipment.

Because of its reliability the Fair-

mont Motor Car is the personal choice of at least seventy percent of all track foremen. This suggests the thought that if Fairmonts are popular, they are good cars to buy and that this reliability will be reflected favorably in the savings made.

Everywhere maintenance officials and railway executives are voicing their faith in Fairmonts.

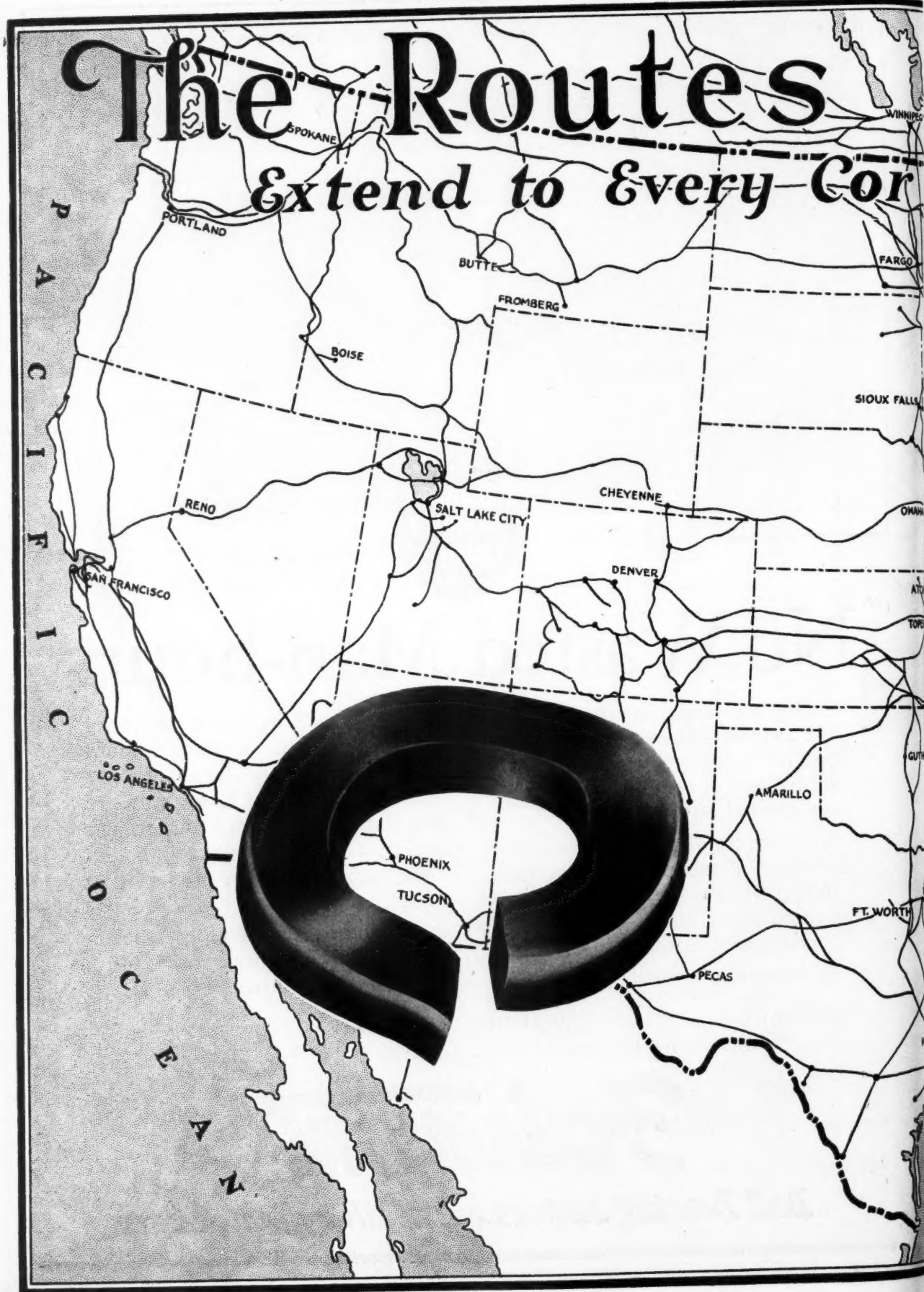
FAIRMONT RAILWAY MOTORS, INC., FAIRMONT, MINNESOTA

*Descriptive Bulletins of Entire Line Supplied at Your Request*

# Fairmont

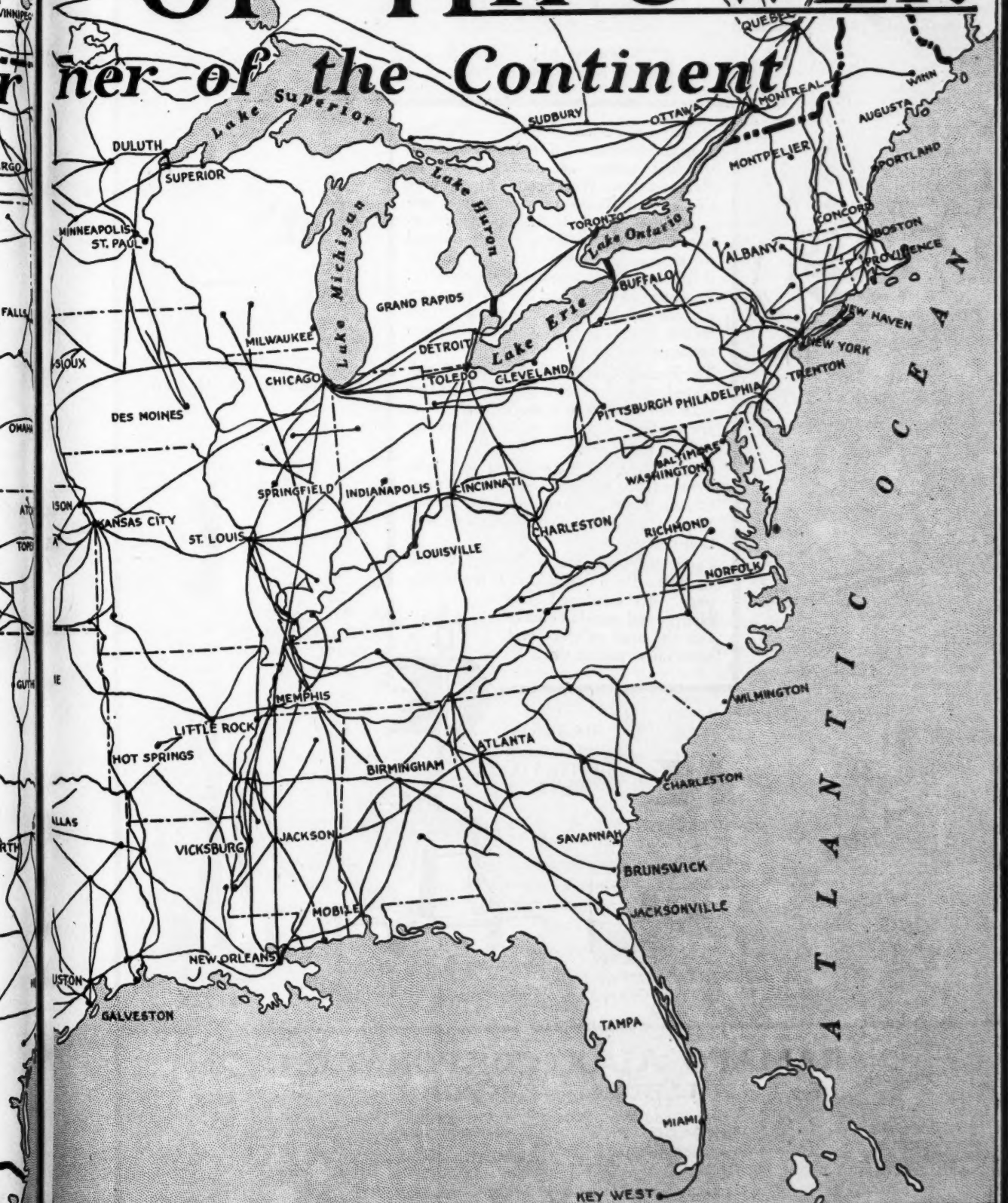
**Ball Bearing Motors and Railway Motor Cars**

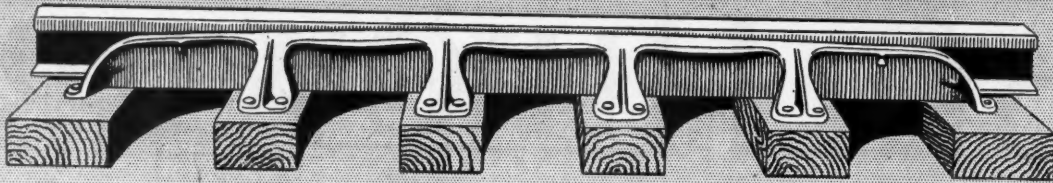
The Routes  
Extend to Every Corner



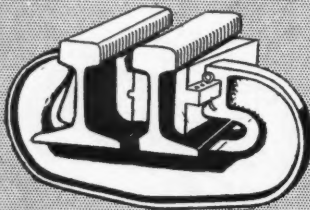
# of HIPOWER

## ner of the Continent

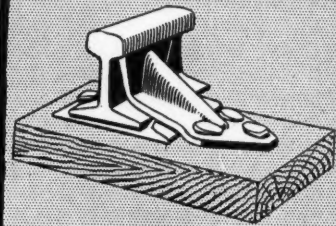




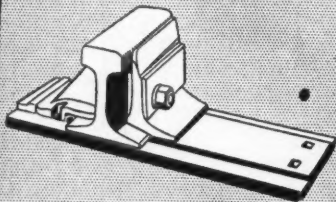
**AJAX MANGANESE STEEL  
ONE-PIECE GUARD RAIL**



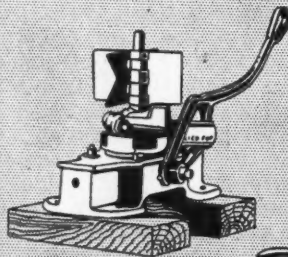
**RACOR FORGED  
HEAVY DUTY  
GUARD RAIL CLAMP**



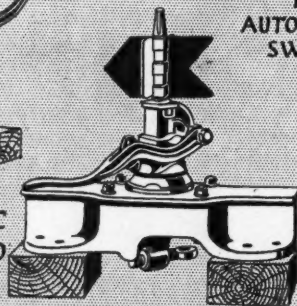
**RACOR  
FORGED RAIL BRACE**



**RACOR DOUBLE SHOULDER  
SOLID BOTTOM  
SWITCH RISER PLATE**



**RAMAPO AUTOMATIC  
SAFETY SWITCH STAND  
Style No. 20-B**



**RAMAPO AUTOMATIC  
SAFETY SWITCH STAND  
Style No. 19**

**RAMAPO  
AUTOMATIC SAFETY  
SWITCH STAND  
Style No. 18**



**RAMAPO  
AUTOMATIC SAFETY  
SWITCH STAND  
Style No. 17**



Ramapo and Ajax specialties have been long and favorably known under their individual names as manufactured by Ramapo Iron Works and Ajax Forge Company. These two companies are now consolidated into Ramapo Ajax Corporation, with five completely equipped works conveniently located for prompt deliveries to the railroads of the country. To assure service in the Western territory a stock of Ramapo Automatic Safety Switch Stands is carried at the Chicago headquarters.

The Ramapo improved No. 20-B stand, placed on the market a year ago, has met with pronounced success. Repeat orders are coming in wherever it has been installed.

Other "RACOR" specialties not here illustrated include Switches, Frogs, Crossings, etc., Special Railway Track Work, Cast and Rolled Manganese Rail Construction, etc.

Particular attention is directed to the Ajax One-Piece Guard Rail at top of this page. Its combined simplicity and rigidity make this the most efficient and economical installation.



**RAMAPO AJAX CORPORATION**  
**HILLBURN · NEW YORK**



*This Company is a  
consolidation of  
Ramapo Iron Works  
and Ajax Forge Co.*

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**CHICAGO**

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**NIAGARA FALLS, N.Y.**  
**SUPERIOR, WIS.**

*Canadian Ramapo Iron Works Ltd., Niagara Falls, Ont.*



## ANYTHING AND EVERYTHING FOR OXYACETYLENE WELDING AND CUTTING



Public faith in a product is a reflection of faithful performance. Thus, consistently, have Airco Oxygen and Airco Acetylene built up good-will.

Write for Airco booklet:  
"Anything and Everything for Oxyacetylene Welding and Cutting"

### AIR REDUCTION SALES COMPANY

Manufacturer of Airco Oxygen — Airco Acetylene — Airco-Davis-Bournonville  
Welding and Cutting Apparatus and Supplies, Acetylene Generators, and  
Specially Designed Machines for Automatic Welding and Cutting--  
Nitrogen, Argon and other Airco Atmospheric Gas Products

Controls the manufacture and sale of National Carbide

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Airco District Offices, Plants and Distributing Stations conveniently located throughout the Country

Air Reduction Sales Company  
maintains its own Apparatus  
Repair Shop in each Airco  
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"Airco Oxygen and  
Acetylene Service is  
Good Service"

SERVICE

MONOCY

# BETHLEHEM

## STEEL COMPANY

Will Manufacture Selflock Products

After several months of thorough investigation and tests the Bethlehem Steel Co. has entered into an agreement to manufacture and sell Selflock Products.

This endorsement further guarantees the merit of Selflock Products to the present users and to Engineers who are now considering service tests.

Selflocks always sell on their merit and their record of service.

Pick out some difficult crossing to demonstrate the economy of Selflock bolts. Write to

**SELFLOCK NUT AND BOLT CO., INC.**

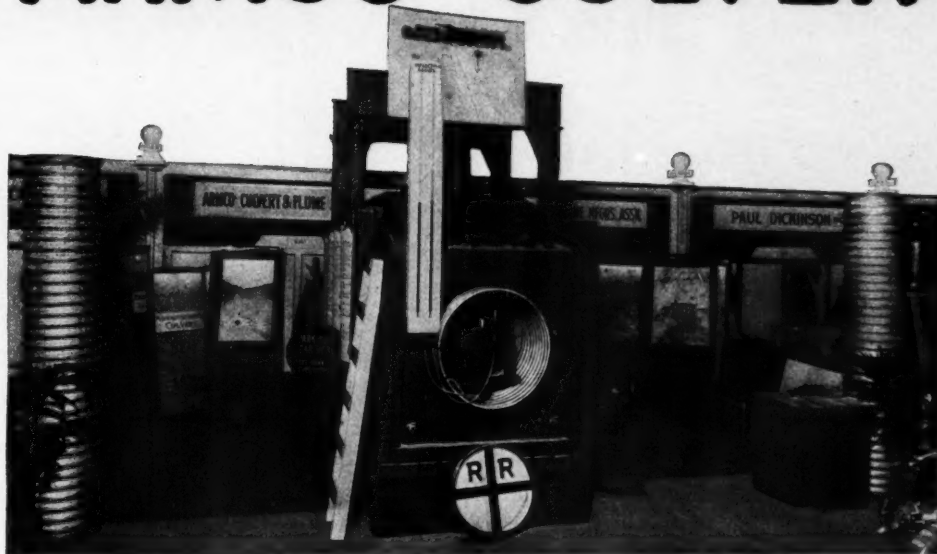
EAST SYRACUSE, N. Y.

OR

**BETHLEHEM STEEL CO.**

BETHLEHEM, PA.

# A Railroad Strength Test of ARMCO CULVERTS



A 30 in., 12 ga. ARMCO Culvert, 14 ft. long supports a dead weight of 240,000 lbs. under railroad conditions at Annual Exposition of the National Railway Appliance Association.

**T**HE illustration above shows the apparatus used. The pressure was applied by two 100-ton hydraulic jacks on two beams, simulating rails, placed on three standard wooden ties. A scant 12 in. of dry sand furnished the fill between ties and culvert.

The machine was designed for a load of 100 tons. Such a load

showed no effect upon the culvert, and drawing on the factor of safety a load of 120 tons was imposed.

Even with this load there was no observable variation in the horizontal and vertical diameters of the pipe—no measurable deflection.

The conditions of this test indicate a safety factor of approximately  $2\frac{1}{2}$  over the normal railroad installation, definitely satisfying the engineers who witnessed the test that ARMCO Culverts are amply strong for main track use. A 10-gauge pipe would greatly increase this safety factor.



Installations such as this are even a better test of the ability of ARMCO Culverts to meet railway requirements.



Under the main line tracks of one of the busiest railways in America—dozens of trains each day.

There is a manufacturer in almost every state and in Canada, making Culverts, Flumes, Siphons, Tanks, Roofing, etc., of genuine, rust-resisting Armco Ingot Iron. Write for full information and nearest shipping point on products in which you are interested.

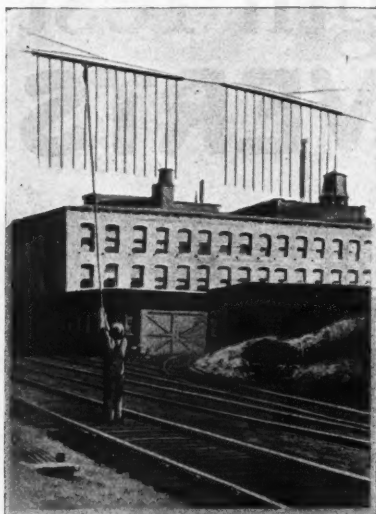
The ARMCO Culvert & Flume Mfrs. Assn.

215 N. Michigan Ave., Chicago



## ARMCO CULVERTS

# HASCO AUTOMATIC TELLTALE HANGER and REPLACER



**THE HASCO METHOD**

**One Man**  
WITH  
**Hasco Method**  
OR  
**Three Men**  
WITH  
**Old Method**



**THE OLD METHOD**

It is time you stopped and figured what it is costing you for labor,

sending a crew of three or four men over your road with a long ladder to make **telltale** changes.

If you do so, you will be surprised at the enormous cost, and upon inspection, you will also find that on account of the difficulty and expense in making these changes, your bridge and tunnel warnings are neglected, and accidents to your employees possible.

With the Hasco Hanger you insert our Replacer at the end of a light pole; and to repair old telldaes or to make changes, you merely hook top guide of Replacer at end of toggle and pull down. This will drop the old pendant out. To replace telltale you place wire end of pendant between the wings of Replacer and by reaching up to crossbar (being guided by guides of Replacer) the telltale is easily inserted into the hanger.

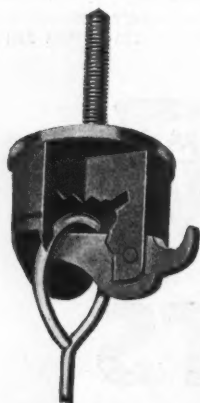
This can be done by the track inspector or section man in a few minutes as they go over the road daily at no added expense to maintenance, thereby saving your entire present cost of labor and assuring you that your warnings are always 100 per cent efficient.

Our hangers are made of bronze, will not rust, corrode or wear out. It is impossible for telldaes to become entangled with each other or over the crossbar.

For the past three years this device has stood the severest tests on one of our leading railroads.

We are also prepared to make up telldaes, consisting of part bronze wire and waterproofed and fire resisting, treated rope, to your specifications.

May we send you a descriptive circular or arrange for personal demonstration?



**HANGER**

**Hastings Signal & Equipment Co.**

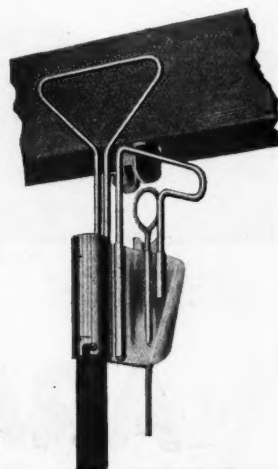
53 State Street, Boston

*Selling Agents:*

ROSS F. HAYES  
2 Rector St., New York

T. W. SNOW CONSTRUCTION CO.  
332 La Salle St., Chicago

HICKOK & HICKOK  
Santa Fe Building, San Francisco



**REPLACER**



## Here's a Mo-lyb-den-um *Light-weight* Shovel

*Averaging from six ounces to one pound lighter*

**M**EET the world's champion light-weight—the Wood's Mo-lyb-den-um light-weight steel shovel.

Here is a light-weight shovel that will stand many times as much service as an old style standard gauge shovel. Yet it averages six ounces to one pound lighter.

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# Railway Engineering and Maintenance

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## THE RENEWAL OF THE BALLASTED DECK TRETTLES

**T**HE report of the committee on the renewal of ballasted deck trestles presented before the Bridge and Building convention, contains much information on a subject which has hitherto received little attention. It is only a little more than 20 years since this form of construction was first given extended use and because of the excellent service which it affords it is only within recent years that the problem of renewal has been imposed to any extent upon the railroads. So, although the problem of renewal has been a matter of considerable speculation for a long time, it is only within the last few years that the maintenance officers have had to deal with this problem as a practical proposition.

In the opinion of the committee the type of ballasted deck in which the stringers are spaced an appreciable distance apart and are covered with a solid plank floor to retain the ballast, is superior, from the standpoint of convenience in renewal, to the type embodying a solid deck of stringers. The former type of construction, corresponding more nearly with the ordinary open deck trestle, can be handled in much the same way when it comes to the repair or renewal of either the deck or the bents. In other words, individual stringers can be removed and replaced without serious disturbance of the other portions of the deck and, likewise, the stringers may be shifted readily to provide space for the driving of additional piles in the bent.

This phase of the renewal problem must also be considered from another angle for, as pointed out in the report, it is very easy for the men engaged in this work to do serious damage to the various parts of the deck through cutting or bruising of the creosoted timbers, something that must be very carefully avoided. Therefore, the form of construction which involves the least possible disturbance of the deck is necessarily least liable to injury from this cause.

## HAVE SYMPATHY FOR THE FOREMAN

**I**T IS not often that a genuine human appeal has a prominent part in the field of the technical journal, yet there is a striking illustration of this in this issue under the head of the "What's the Answer" department in the replies received to the question as to the advisability of having track foremen ride over their section on locomotives or trains to determine the riding qualities of the track. All of the replies are in the affirmative and it is to be noted that four of them are from section foremen. While it is to be conceded that the conclusions reached with such unanimity in these answers is founded on sound reasoning, we wonder if the wish is not father to the conclusion, in other words, whether the foremen may not have been influenced in their answers by the fact that they would very much like to ride

on the trains as suggested, not only over their own section but over other parts of the railway as well. But should not the superior officer be sympathetic with the foreman in this desire and give serious consideration to the underlying conditions which are responsible for it?

Few men on the railroads are so entirely isolated in their work as a large majority of the foremen. Trainmen are always on the go, carpenter forces move from place to place, water service repair men travel almost continuously. Mechanical employees and clerical forces, of course, are given little chance to travel, but they live in terminal groups of considerable size, if not actually in large cities. But except for the few trips up and down the line which the foreman makes when not on duty, or for the occasional emergencies which require his presence on other sections, the foreman is tied down to his own six miles of railroad, the only part that is really his. The rest of the road is around the curve or over the top of the hill beyond the ends of his own section and except for occasional visits from the roadmaster or the wave of a hand he gets from someone on a passing train, he is left pretty much to himself.

In these days when the problem of securing high grade foremen is a most serious one it would seem well to consider all the factors having an influence on the attractiveness of the foreman's position. More efforts should be made to make him feel that he is a part of a railroad and, in particular, a part of the division on which he is employed. It will be difficult to do this unless some effort is made to acquaint him with the rest of the line, with his brother foremen and with the work that they are doing.

## THE MARK OF A GOOD MAN

**O**N EVERY railroad there are good men and poor men, hard workers and drones, men who work because they should, others only because they must. You can tell them by their marks. Some of the marks are apparent when you meet the man, others when you watch him work, but however and wherever they show themselves the fact remains that you can classify your man correctly if only you can distinguish his marks and give each its proper value.

Consider the fellow who tackles the difficult jobs as though each were an opponent, or a contest between the human and the material, in which the man is determined to win. In water service, for example, such a man finds a break-down on his hands and the more it resists repair the more determined he is to fix it, using a chisel if his drill breaks, hay-wire if the bolts are gone, the sole of his shoe if a gasket must be had, even the shirt off his back, if necessary, for packing. In patrolling track he sees in the presence of a storm not the excuse for his doing less, but a challenge to work the harder. When removed from the eye of the supervi-

ing officer his attitude is one of living up to a sense of responsibility, not one of seizing upon a rare opportunity to sluff. When the trouble is a burn-out, the time of the day is the last thing he thinks about.

He is a good man, you will say, that will do these things, if only he can be found. The marks are unmistakable. He is indeed a good man. The gratifying thing is, moreover, that there are such men. It is not correct to say that they are no longer to be found on railroads. Instead, they are plentiful. Only recently an instance of this was reported when a roadmaster, confronted with destruction of track by floods, proceeded without waiting for authority to hire an airplane with which to inspect the flooded area and learn the damage done with the minimum loss of time. The operation of our railroad is replete with similar, although perhaps less spectacular, instances of worth among railroad men.

The point is that such men are good men, notwithstanding they may be sullen fellows, dark skinned or yellow, neat or slovenly. The fault with some officers is the same fault with which they often charge higher officers, the inability or failure to study their men carefully and to judge them in accordance with the true value of their marks. So to judge them, especially when personal dislikes are involved, may be difficult but it should be the aim of every officer to do so in his own interest and that of the company he serves. Certainly it is much the better plan for an officer to conduct himself in relation to his men according to such a program rather than to let himself be governed too much by these personal dislikes and to decry the passing to a period when, as he allows himself to believe, railway men were better men than they are now. Moreover, he will at once find himself enjoying his work the better through the greater respect he is bound to receive by reason of this broader viewpoint and more dispassionate judgment of those with whom he comes in contact.

#### IS YOUR WATER SUPPLY FREEZE PROOF?

**A**LWAYS with the approach of winter there is an established program of work carried out by water service forces to guard against freeze-ups. Prominent among the work done usually is the cleaning out of tanks containing sediment, the banking of pump houses, the covering of exposed pipe lines, the renovating of stoves or other heating apparatus, the stocking of coal bins, the sealing of cracks in buildings and the hiring of additional help where necessary to keep fires going. Having completed this program the water supply is ready to be "chalked up" as being ready for the winter.

But is it? To a large degree, yes. A program of work such as outlined cannot be completed even in the coldest sections without substantial effect. The failure to do so would soon make the truth of this apparent. But the facts are that each winter continues to exact its toll of freeze-ups or related troubles peculiar to the season. It may only be a case of frozen valves in a

pump or an engine so thoroughly chilled as to be difficult to start, ice around the tank, a frozen indicator, or foot valve. On the other hand, it may be a broken pump chamber or a drain valve below a treating plant, an air-lift system made less efficient, or a clogged sewer. The effect in all cases is appreciable and very often becomes serious—a period of inoperation or imperfect operation, for instance, at a place and at the time of the year when the best service is none too good, a greatly increased expense for making repairs when conditions are most unfavorable for the same, the virtual undoing of the protective measures taken earlier, the worry resulting from the uncertainty established by repeated disruptions of service, and often, indeed, the added destruction of property through fire which results from attempts to warm up engines or thaw out frozen areas.

The reason for much of this trouble is a weakness in the program undertaken, presumably to prevent it. Too often the program of frost protection is carried on perfunctorily as though it were simply a seasonal

job that must be done. Little thought is given to the real purpose of the work and less to the ability of each measure taken to accomplish this purpose. Thus a frost box is banked in the same way it was banked in the previous year, although perhaps the earlier preparations had repeatedly proved ineffective. Again the same provision is made for drainage, although past records would show this method of drainage to be especially exposed to drifting snow, or again careful attention is given to providing protection at the pumphouse, but the same lack of attention given to the comfort of the pumper, which underlay trouble the year before. Thus the work is improperly done or something overlooked which is essential to the sufficiency of work which was done at the point in question.

The lesson is plain, it should be the aim of the water service officers not merely to see that a perfunctory program is carried out, but that this program is thorough in scope and the work adapted to the exact requirements at each point, as determined from past experience and the study of the causes of troubles which have been encountered. When freeze-ups do occur where protective measures have already been made it is but another illustration of the truism that a chain is no stronger than its weakest link. The problem, therefore, in connection with the protection of water supply facilities from the rigors of winter, is to find that link and give it equal strength with the rest.

#### WHERE ARE THE SECTION FOREMEN TO COME FROM?

**T**HAT the recruiting, selection and training of men for the positions of section foremen is one of the most vital problems with which the maintenance of way department is now confronted has been generally conceded. Conclusive evidence of the widespread interest in this question is to be had from the fact that 37 contributions were received in the contest on this subject,

#### RAILWAY PROBLEMS WILL DISAPPEAR

It must be recognized that the railways are making supreme effort, with much success, to meet the demands upon them. They are now more efficient than at any prior time in their history. With fewer men they have in recent months exceeded all prior achievements. They have been handling tonnage in record volume so efficiently that there has been scarcely a murmur of complaint and so smoothly that their marvelous performance is scarcely noticed. Already superior in public service to every other system of transportation in the world, they are headed for better work in which there is promise that railway problems will disappear.—*Interstate Commerce Commissioner Potter in dissenting opinion in Assigned Car Case, June 13, 1923.*

of which the prize winning and three others are presented in this issue. It is also of special interest that many of the papers submitted were prepared by section foremen and that the prize winning paper was written by an assistant foreman. Surely the handicaps and limitations of the foreman's position can be known no better by anyone than by the foremen themselves and no others are better qualified than they to realize the shortcomings of the men from which the roads are now trying to develop new foremen to replace those who are granted a well earned retirement.

If any criticism were to be offered with respect to the papers received it is that a relatively small number of practical suggestions were submitted with respect to the manner in which better men are to be recruited into the gangs. This is in no sense a reflection on the contributors, but simply goes to show that this is the most difficult part of the problem. In a word, it is easy to train a good man if you have a good man to train.

Many of the papers advocate apprenticeship systems, namely, special arrangements for training men especially selected for this purpose, usually from outside the regular force, and suggestions are offered for the recruiting of school boys, either from grammar or high school, and lay stress on the need of education for the handling of the foremen's records. But in the face of a public educational system that tends primarily towards the building of candidates for white collar jobs, there would seem to be limited opportunity in that direction, except in certain restricted areas of limited opportunity where the chances for the young man to get a job are few and far between.

In the main, therefore, is the problem not primarily one of making the best of the men that we have in the gangs—men who come to us because they need a job or because they have found track work to their liking? Among these are not the unsophisticated country boy in the backwoods, the Hungarian, Pole, Bulgarian, etc., in the east and middle west, the negro in certain parts of the south, the Mexican in the southwest and the Japanese and Chinese in the west, the most promising material. These men do not take up track work because they lack ambition, character or stamina necessary to get into better paid work, but because lack of opportunity, accident of birth, ignorance of our language or unfamiliarity of our customs afford them little chance to take up one of the so-called "skilled trades" which pay higher wages.

Experience has shown that the selection of the brightest, strongest and most energetic from the ranks of these will produce section foremen of a high grade. It is true that the training of such men takes longer, must be more painstaking and must be of a more detailed nature than that required of the man who possesses a better educational foundation, but there is less danger of wasting the effort through having them quit after the training is completed.

The problem of obtaining high grade foremen is unquestionably a difficult one to solve and we feel that our contributors are to be commended on the painstaking study which they have given to the subject. Clearly, it calls for as much effort on the part of the supervisory officers as any other phase of their work and it may be said without question that they have measured up well to the responsibilities imposed on them in this regard. It would seem, however, that certain phases of this problem concern matters which must be taken under consideration by the managements, and that they owe it to their supervisors and roadmasters to lend a willing ear to such suggestions as are offered for a satisfactory solution of the problem.

## Letters to the Editor

### OILING ANGLE BARS

Muncie, Ind.

To the Editor:

In addition to the advantages of oiling angle bars in track mentioned in the "What's the Answer" department of the August issue of *Railway Engineering and Maintenance*, we find that oiled angle bars facilitate the closing up of the joints in warm weather. We have several miles of 60-ft. rails laid with the joints open  $\frac{1}{4}$ -in. to take care of the expansion. If many of these joints fail to close up we have trouble with sun kinks and it is then necessary to loosen the bolts to permit the rails to go together before the track can be lined up.

GEORGE POWELL,

Division Engineer, Union Traction Company of Indiana.

### A GRADUATED WAGE SCALE

Marysville, Cal.

To the Editor:

I have been much interested in the suggestion made by L. Flynn in the September issue of *Railway Engineering and Maintenance* to the effect that the men in a track gang should receive different rates of pay, depending upon their ability. I believe that the railways would secure a better class of men if they would pay a higher rate to the more efficient ones. There are men in every gang, regardless of its size, who are more capable than others and there are also men who will shirk at every opportunity. While I do not believe that there should be as many as seven or eight different rates of pay, I do think that there should be three. If the flat scale is 37 cents per hour, I suggest that the lowest rate be made 36 cents, the intermediate rate 38 cents and the rate for the best men 40 cents. This would encourage the efficient men to endeavor to qualify for the highest wage. It would also encourage men to remain in service and avoid the necessity of training so many new men.

The selection of the men who should receive the increase should be left to the roadmaster, who would act on the recommendation of the foreman, for I fear that if too much was left to the foreman all of the men in some gangs would receive the highest rate.

J. E. MOLONEY.

### NEW BOOKS

**Southern Pine Manual.** 186 pages,  $4\frac{1}{4}$  in. by  $6\frac{3}{4}$  in., illustrated. Bound in imitation leather. Published by the Southern Pine Association, New Orleans, La. Price \$1.50.

This is the ninth edition of the Southern Pine Manual of Standard Wood Construction and is a handbook designed for the use of architects, engineers, contractors, builders, dealers and others interested in wood construction. Except for certain additional data and the exclusion of legal safe working stresses as adopted and changed from time to time by the various municipalities throughout the country, the text of the eighth edition has been retained. The additional data include the latest requirements for floor and roof loads for the largest cities about the country; new material on wood block floor paving and construction; details for design of light wood roof trusses on spans up to 125 ft.; timber working stresses and design factors based on recent comprehensive tests of commercial southern pine; and safe working loads for bolted, nailed and spiked connections.

# How Can We Develop Good Foremen?

Prize Winning and Other Contributions to the Contest on the Selection of These Important Men in the Track Organization

**T**HAT the problem of track foremen is at once one of the most serious and most absorbing questions now before the maintenance of way organization is manifested by the interest taken in the contest announced in the September issue of *Railway Engineering and Maintenance* for papers on the recruiting, selecting and training of men for the position of section foremen. Thirty-seven papers were received. The judges who selected the winning papers were C. G. Delo, chief engineer of the Chicago Great Western; A. S. Kent, chief engineer of the Chicago, Indianapolis & Louisville, and B. M. Cheney, general inspector of permanent way for operating vice-president, Chicago, Burlington & Quincy. The selections were made by the judges without a knowledge of the names of the contributors, and resulted in the award of the first prize to F. B. Whitman, assistant track foreman, Chicago, Burlington & Quincy, Centralia, Ill., and of the second prize to J. W. Powers, supervisor of track, New York Central, Rochester, N. Y. In the opinion of the judges a number of the other papers merited special mention among which may be listed those prepared by D. K. Newmyer, roadmaster, Southern Pacific, Seabrook, Tex.; T. F. Donahoe, general supervisor, Baltimore & Ohio, Pittsburgh, Pa.; T. H. Portel, foreman, Chicago, Rock Island & Pacific, Des Moines, Iowa, and J. D. Keiley, supervisor, Chesapeake & Ohio, Richmond, Va. Papers prepared by these contributors, except Mr. Keiley, are presented below. Mr. Keiley's paper and those of others will appear in later issues.

## First Prize—The Problem as Seen by the Man in Training

By F. B. WHITMAN

Assistant Foreman, Chicago, Burlington & Quincy, Centralia, Ill.

The primary qualifications of a good section foreman are the ability to handle men well and a good knowledge of track work. Unless a section foreman possesses both of these requisites, a roadmaster or superintendent cannot hope that his territory will be maintained in an efficient or safe condition. If a section foreman cannot handle men he will be unable to get the best and maximum amount of work that his men can give, and if he is deficient in a good knowledge of track work, he will be unable to obtain results because of his sheer inability to know what work should be done and how it should be done to keep up the track. Particularly should the section foreman know the first things that should be done in order that the track be in safe condition for the passage of traffic.

Of course, both of the above mentioned qualifications are necessary, but it must be realized that the ability to handle men is one which is more innate, while a good



*The Foreman Himself Makes the Best Teacher.*

knowledge of track may be acquired by training and experience, because, by sufficient training, a good man can be taught to recognize and apply the principles necessary for the construction and maintenance of good track, while if a man is born without the ability to direct the work of others, such ability cannot be developed in him. It is much harder to teach a man how to get the best and most efficient work out of his subordinates than to teach him the fundamentals of maintenance.

A third qualification which is most desirable in a section foreman is that of reliability. This is almost as cardinal a quality as the first two. The roadmaster and the superintendent must know that in their absence from the immediate vicinity the track must be inspected and maintained so that at all times and under all conditions it will be safe for traffic. During times when there are heavy storms or severe weather conditions, there must be no doubt that all dangerous conditions will be cared for so that trains may not be put in danger.

Other desirable attributes of a section foreman are interest in his work, adaptability to new methods and modern conditions, loyalty to the company and resourcefulness. A man who is interested in his work inspires interest in others. He is constantly trying to devise new methods and plans for getting various jobs done promptly and economically. He should possess the ability to adapt himself and his practices to new methods and devices that his superiors think desirable for the best performance of the work. He should possess intense loyalty to the company for which he works, as this gives the best possible insurance that all work will be accomplished with economy, neatness and dispatch. Also loyalty to the company usually means that he will be a staunch local champion of the company's interests in the community in which he is located. This is of particular advantage in localities where the community is prejudiced against the railroad company. Resourcefulness in a section foreman is an advantage because of the many times a foreman is called upon to do difficult tasks with limited amounts of labor and material at his disposal. A man who can devise ingenious and effective methods of accomplishing work with the tools and forces at his command is very desirable. He will rise to meet the many emergencies that constantly come up on a railroad.

### Methods of Inducing Men to Compete

To induce men to compete for the position of section foreman, it is of first importance that the pay and authority of the position be made sufficiently attractive to stimulate the desire of men for promotion. This means that the differentials in rates of pay for laborers and foremen and assistant foremen should be great enough to arouse ambition for advancement. One plan in effect on a large railroad is to give new section foremen a rate of pay

which is increased with the years in service. Other plans for making the remuneration of a section foreman desirable lie in providing attractive houses, rent free, free fuel, etc.

In addition to making the rates of pay of foremen great enough to be attractive, it is suggested that during the period of training before promotion the pay of candidates be increased on a length of service basis. Great care must be exercised, however, that differential rates be devised so that they will not operate to discourage older men in service who are not suitable for promotion. For this reason, it is recommended that an apprentice plan be instituted with regular indenture papers and that all new men be paid a lower rate, which will be increased perhaps two cents per hour for each six months' period in service up to two years. At the end of the two-year period, each new man should have had sufficient opportunity to demonstrate his ability as to whether he has sufficient qualifications for promotion.

Other means of inducing men to compete is the opportunity to learn all that can be learned about track work and also of working in attractive and desirable locations. The seniority rules of many railroads preclude much choice in the assignment of locations, but by co-operation between the division superintendent and his various road supervisors and roadmasters, desirable men may be offered employment in places where a great variety of good experience in the construction and maintenance of good track may be obtained. By appointment of men as assistant foremen in yard gangs and extra gangs, men may be made familiar with many essential principles of good track work that they might not acquire in the regular routine of section work.

Since it is desirable to recruit section foremen from the working forces, efforts should be made to have the section foremen and various agents keep in touch with boys and young men in communities along the line, particularly those young men who are just completing common school or high school educations, in order to recruit them into the apprenticeship system with section gangs. Roadmasters should also endeavor to keep in touch with train service employees and officials to recruit sons of these men into maintenance service.

Foremen should be conferred with from time to time to find out whether they have men in their gangs who might be developed for promotion. This should be done in order to give older men a chance for advancement. Great care should be taken not to lay plans for the development of more men than for which vacancies occur so that present foremen may have reasonable assurance that new men will not be used to replace them except in cases of unsatisfactory work, for it often happens that good men in gangs are not recommended because the foreman fears that his own job may be taken away from him.

### Training Men

Below is a list of the means suggested by which men may be trained.

1. Practical experience both with and without apprenticeships.
2. Conferences and classes with roadmasters and section foremen.
3. Trips over other sections.
4. Roadmasters' bulletins and circulars.
5. Examinations.
6. Prize papers.
7. Books and magazines.
8. Correspondence courses.

A regular program of training and instruction should be laid out for the development of prospective candidates after a conference of section foremen, road supervisors,

roadmasters, division engineers, superintendents and all maintenance of way officers has been held and it has been agreed upon what plans and methods will furnish the best system of development. In case the road has a specially established personnel department, this organization can usually render material aid in the development and execution of the plan.

The program of training should comprise practical work in both maintenance and construction of track. There are many items of work in construction and extra gang work which are seldom encountered in section routine, but which may be very helpful to a section foreman in cases of emergency. For this reason, it is deemed essential that some part of the training period be spent in extra gang work. Also it is recommended that a candidate be given some experience in yard section work so that he may become familiar with the laying and repair of switches and yard leads, and also the necessity of doing work under pressure of short time and interruption caused by traffic. Any program set up must be only tentative, since it will be necessary to vary it according to the work being done on the division or district.

Care should be taken that candidates be placed only with those foremen best qualified to train and teach men the elements of track work. Many a good man has been lost to the road because he has not had the chance to develop under a foreman who not only knows how good track work should be done, but who can teach others to secure good results. The foremen who are selected to act in this capacity should be instructed to allow the apprentice to act as foreman from time to time both while they themselves are present, and also in their absence, so that the candidates may develop their ability to handle men.

Roadmasters and road supervisors should endeavor to meet with prospective candidates who have completed their first year's work once every three months during the training period, preferably in groups, so that they may learn what progress they are making. At such times men should be asked such questions as will show not only how much the various men have learned, but also which will be instructive to the other men in showing them what are the most important elements of efficient and economical track work. These conferences should be supplemented by a series of written examinations to determine the progress of the men. In the case of those railroads which have personnel departments which aid in supervising the training, the brunt of this work may be thrown to this department, keeping in mind the necessity of emphasizing the practical character of the conferences and examinations.

Although track work may best be learned by practical experience out on the job, men should be encouraged to read books and magazines concerned with subjects on track work. To this end, a list of good books simple to read and understand should be issued to all candidates and in conferences the roadmaster should ask such questions as will show how much reading has been done. Old issues of maintenance periodicals should be distributed to candidates by a process of rotation and the men should be encouraged to subscribe to such magazines. Occasional questions will serve as a check on this reading.

Practical correspondence courses in track work are to be had which may be extremely helpful in improving a man's knowledge of track work. Particular mention and recommendation of such courses should be made by roadmasters and men should be encouraged to undertake and complete such courses. Some roads even make it a practice to assist men financially in the taking of these courses. Among other means of training men may be

mentioned opportunities for them to make inspection trips over sections where particularly difficult maintenance conditions may be encountered or which are exceptionally well maintained. Candidates should be accompanied on these trips by the foreman of the section or by the roadmaster so that the important points may be explained to them and so that they may be taught to recognize the essential elements of good track.

## Second Prize—The Requirements from the Viewpoint of the Supervisor

By J. W. POWERS,

Supervisor of Track, New York Central, Rochester, N. Y.

The demand for trained, efficient track foremen is universal and that there is a lack of material from which to create them is admitted and calls for serious consideration; just how serious may be conjectured from the ineffectual efforts of some of the most able railway men in the country towards the solution. The outlook for the future is even more discouraging, for the class of men now being drawn into the ranks as laborers does not offer a promising field from which to recruit foremen.

There was a time when any sensible man with some experience in track work, even though illiterate, would have been eligible for the position. It is a fact that some foremen, who were considered good at that time, could neither read nor write. However, an illiterate man labors under disadvantages which cannot be overcome to any extent unless he possesses determination to take up, study and learn the rudiments of our language. The ability to read and write is necessary to the acquisition of ideas and the more thorough understanding of the every day instruction that he may receive concerning his work. If he is able, by the means of books or other publications, to learn how many standards are adopted, why rules or formulas are given, he will quickly outstrip the man who must depend wholly on oral instruction or personal observation for his knowledge. Illiterate men, although they may be expert workmen, prove to be very unsatisfactory foremen, but many cases have been brought to our notice where they have been encouraged to take up, at home or at evening school, the first steps toward acquiring an education and have afterwards become valuable acquisitions to the force of foremen. Such as have the will or force of character to study at a mature age certainly have much of the necessary energy required of the satisfactory foreman. The successful foreman of today must be a man of higher standard of intelligence and training than was formerly considered necessary, and while we cannot expect a finished scholar the man should at least have a common school education. The very diversity of the duties of a section foreman is indicative of his importance and it is essential that he be familiar with them all. His field of work is not for experiment and speculation, based upon conditions of present requirement.

He must know that every act he performs will be one to the economic interest of the company he serves and at the same time to the permanent betterment of conditions, otherwise it would not be economy. A citation of the rules of any of our large railroad systems would briefly present a schedule of his partial qualifications. His position entails more actual responsibility than any other of a subordinate character in the service. The safety of the lives of all the passengers and the immunity of traffic from accidents of a serious nature devolves directly upon him. Any little oversight on his part may be fraught with serious consequence, costing the company thousands

of dollars. Hence he must be eternally alert and vigilant. Primarily he must be honest, of fair education, industrious, patient, physically sound, of good moral habits, ambitious, mature judgment and have substantial experience in track work.

His executive ability must also be of a high order. There are a multitude of other qualifications that are very desirable, but possessed of these enumerated, he will have no difficulty in meeting every occasion to the satisfaction of the company he serves. Far too little attention has been given to the training of the section foremen for the important duties they must assume in taking charge of a section. A vacancy unexpectedly occurs and a foreman must be sent to take charge of the work. Under the old system, or more properly speaking, lack of system, the best man available is taken to fill the place. He may be a man of good habits, industrious, honest and reliable and have the requisite qualities for a good foreman. If we are fortunate enough to find or select a man possessed of these qualities, he may not be able to make out properly the various reports expected of him.

He may lack executive ability. He may not be able to lay out his work or properly direct his men. He may be too easy going. He may not be able to determine between the essentials and non-essentials in section work. If we had some approved method in vogue of training men for foremen, we should be able to detect these weak points before they are appointed and thus relieve ourselves from such anxiety and many annoyances and prevent our men from the humiliation of being appointed to positions for which they are not fitted, either by training or natural aptitude. Therefore, before a man is appointed to the important position of a foreman, he should be thoroughly trained by competent instructors in every branch of section work. He should not only understand how to do the work himself, but he should be able to direct the men under him.

The training of foremen should be in the line of general information, emphasizing at all times the necessity of thorough work and careful inspection; more specially when engaged in frog and switch work. There are two methods which may be employed in training them: (1) The selection of men direct from the ranks, and (2) the appointment of apprentices. One objection to the apprenticeship system is this. In order to make it successful a little higher rate of wages must be paid to apprentices than to laborers so that they will not be attracted by offers of increased compensation from employers needing temporary service. The higher rate tends to cause dissatisfaction among the laborers. Another objection is that after young men have completed their course and are considered capable of taking charge of a section, it is sometimes found difficult to get them to accept positions in isolated places where many section foremen are compelled to live. Besides, the demand for trained foremen is so urgent that quicker methods must be employed. Therefore, we believe that this method, even with modifications, would not be practical or adapted to the maintenance of way department. The first essential to success is that the supervisor should educate his men for foremen should have it thoroughly understood by all concerned that no foreman would be hired or transferred from another division or road so long as there are men in the ranks capable of promotion and that the position of the foreman or instructor would not be jeopardized by the success of the student or man in training and who is under his charge.

The selection of men to be trained requires careful consideration. Experience has taught that one of whom we have personal knowledge and who has by faithful

service gained our confidence, proves to be the most satisfactory foreman. Such men, together with those who have given evidence of possessing talent for leadership, should be selected for training, provided, of course, they have the before mentioned qualifications.

The training of the section foremen must follow a systematic method of instruction along the lines of their work. One method of educating them is to apply a course of instructions from some of the educational bureaus established by many railroads. I think that such a system is not sufficient in itself and I believe that an opportunity to discuss their work with others of their own class is one of the greatest aids from an educational standpoint.

Conference has the one great advantage over individual study in that the viewpoint of the other man becomes known and often leads to a wider range of thought. The best method to obtain this is to call frequent meetings



**Resourcefulness in a Foreman Is an Advantage Because He Must Often Meet Emergencies**

of all foremen and students in training in a district, at a supervisor's headquarters, to discuss standards, expenses, plans for work, etc. Much valuable information can be given and good results obtained by the presentation and discussion of papers or talks on subjects pertaining to the roadway department, the supervisor by his presence and interest lending the encouragement so much to be desired for the object in view. There is no better way to raise the standard of efficiency and I know from experience that such practice will stimulate a great deal of interest on the part of the section foremen and students in their work.

Much valuable experience and practical knowledge can be acquired by placing these young men with the best foremen on the division. It should be understood by the foreman that it will be to his credit if he trains these men to become first class foremen. It is a good policy to transfer a student to different sections under good foremen, giving him an opportunity to observe the different methods of doing work. It is also well to place him in yard sections and extra floating gangs, and after he has become qualified in his work promote him to an assistant foreman in such a gang. Then as soon as opportunity offers give him charge of a few men and a piece of work and as he becomes proficient gradually add to his responsibilities, thereby developing his executive ability and more clearly indicating to the supervisor the quality of the man in training.

It is extremely important that the man is not advanced too rapidly or beyond his capacity to acquire knowledge or become proficient in the work, as an early failure will be detrimental to his future confidence in himself or of

that of his superior officers. Again, the early or premature advancement of one given to egotism is apt to cultivate that characteristic to an undesirable extent, giving him that false confidence found in many younger foremen, leading as it does to improper judgment in the layout of their work or the management of their men.

Caution should be used not to confine the man to one class of work to the neglect of other branches. While the students are in training, it is necessary that the supervisor and his assistant should visit them as much as possible, talk to them, telling them what to do under certain circumstances and conditions and giving them thorough instructions as to the most economical use of men and material. Whenever opportunity occurs, explain what the results would be if a different method or manner of procedure had been employed. When the student has erred in judgment or made a mistake in his work, the error should be fully explained to him and in such a manner as not to humiliate him; ridicule should never be allowed, leading as it does to the loss of self-respect and confidence of ability.

After a man has been promoted from the ranks, he should receive careful instructions and supervision at all times, but especially at this time, for the first position after promotion is the most trying. Many foremen endeavor to do too much the first few months in order to make a record and in so doing are liable to bring confusion upon themselves and others. It is here they need the advice of men trained to adaptability by experience.

The object of this study and training is to give us good section foremen, men in whom we can place strict confidence on all occasions; men who are bright and active, competent and conversant with the duties and know how to treat their men respectfully and at the same time have the ability to get the work well done by them. And is not this acquired, first, by offering sufficient inducements to secure and retain men possessed of the proper qualifications; second, by making careful selection of men; third, by giving them instructions and chance to learn; fourth, by giving them by fair and interested treatment a respect for and confidence in themselves; and, fifth, by the desired promotion when opportunity occurs and they are qualified?

## **Do Not Overlook Good Material Already in the Organization**

By D. K. NEWMYER

Roadmaster, Southern Pacific, Seabrook, Tex.

In developing foremen under present day conditions, the scarcity of material of the proper type is the chief obstacle and the selecting of the best fitted from those available and their subsequent training is a most difficult problem. The character and environment of this service are of such a nature as to require men accustomed to hard work and exposure and who are steady and self-reliant. In short, seasoned material is required.

The practical course is to choose the most promising from the ranks of our track labor first, even though they may be below the standard desired, and put them in training. The fact that they have worked some time on the track furnishes a degree of assurance that they will stick and are naturally fitted for the work. They have acquired some knowledge also, which is the proper foundation to start building on. With proper handling unpromising men will often develop surprisingly well. The inducements mean much more to such a man than to a young man with an education. Other and more attractive lines are open to the latter and he is apt to become discouraged

and quit, even though he might be prevailed to make the start.

Absolute assurance should be had that no good material in the ranks is being overlooked before surrendering to the idea that none is available. A number of good foremen now in service could neither read nor write the English language a few years ago, but most of these men have acquired what knowledge they have without much assistance while working as laborers. They prove that raw material can be developed satisfactorily.

It is possible at times to pick up desirable young men in small towns or from the country along the lines engaged in work with little future, who can be induced to take up track work if the proposition is presented to them properly. Station agents can frequently be of assistance in this connection, as they are apt to have a line on any likely men and know their habits and fitness for the work.

Many section foremen have sons who are naturally promising material, but in many cases they are prevented from becoming foremen due to the rule against nepotism in effect on most roads. Not being permitted to start work for their fathers, they are drawn into other lines and lost to the service.

There is merit and great possibilities in any well defined method of training men for foremen. Of those methods in effect the student system appears to be the most effective and least cumbersome. Place candidates for promotion with the foreman best qualified to start their training, accompanying this step with a raise of pay above that of the laborer, this system, like any other, depending for success entirely on the amount of interest and good judgment displayed by the foreman and supervising officer. The simpler the work is made to appear at the start the better. Crowding a new man too much is apt to confuse him and discourage him. Concentrate on the most essential things at first and try to impress the apprentice with the desirability of becoming expert in each line of work. In most cases it is advisable to give the student opportunity to serve under more than one foreman. Some foremen are particularly well qualified in certain kinds of work and it is natural to suppose that a good track liner would develop a student better and faster than one not so well versed. The same is true with other kinds of work. Such things should be taken advantage of. Where possible, it is well for them to serve in some good sized yard or terminal for a while, where many features of track work are daily routine that come into practice but seldom on outlying sections. Make a study of the student and help him on the things that come hardest with him.

Supervising officers should take students with them on the motor car occasionally, giving them a chance to see different gangs at work, calling their attention to various track conditions and explaining the different standards of the company to them.

A book of rules and prints of the common track standards should be furnished the student and the foreman should assist him in a study of them. A study of the clerical work should also be made. In some cases it might be advisable for the apprentice to spend some time in the district office under the direction of the roadmaster's clerk.

The establishment of a fixed period of apprenticeship is not advisable. Promotion should come whenever the apprentice is qualified in the judgment of his supervisory officer. When he is able to handle a gang on ordinary work, has been properly impressed with the responsibility of his job and knows the rules and special instructions of the company relative to the safe and proper han-

dling of the work, he can be given an easy section on probation and his education continued under the guidance of his superior officer, who can then be of greatest assistance to him by watching his track and helping him plan his work.

As a great deal depends on the foremen under whom students are trained, some recognition for this added work and responsibility would not seem out of place. All concerned should realize the importance of training men for this important position. It should be regarded as a primary duty and handled as such in order that the organization be held up to a high standard at all times.

## The Country Boy Makes a Good Leader

By T. F. DONAHOE

General Supervisor of Road, Baltimore & Ohio, Pittsburgh, Pa.

The necessary qualifications for a section foreman are: He must be physically fit to stand hard work out of doors in all seasons of the year, he must have the ambition and energy necessary to learn to be an efficient workman with all the tools needed in track work and the best worker in his gang. He should have a good disposition so he can be easily instructed, be ready to stand criticism, a good mixer with his fellow workers and a leader rather than a driver. He should have enough education to read and write so as to be able to make intelligent reports and read practical articles and books on track work. He should show an interest in his work, be observant and ask plenty of questions and know just what he must learn in order to qualify as foreman. As a general rule, a country boy, having an eighth grade education, used to heavy work, long hours and capable of thinking for himself, makes a good leader when shown that it does not take any more energy to direct men than to handle a No. 2 shovel.

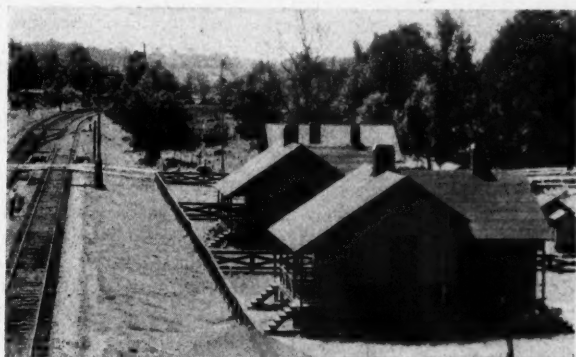
The necessary experience for a trackman to become a foreman depends on the man and the place where he works. Any good, strong young man with an ordinary education, starting at 18 or 19 years of age, could be sure to qualify in three years. I have seen some very good ones develop in less time and know of one who developed in 19 months and was capable of handling a big yard. The interest he takes in the work and the interest the supervisor takes in the man shortens the time required to qualify.

The class of men now working on the track of the majority of railroads (except the country districts where we get native labor) are not the class of men who make good foremen. Any class of men employed will always have a few men who can be trained for foremen by education. It takes five to six years to develop this class of men, but as a rule they have worked hard and long and give their best efforts and will improve with direct supervision. Any laborer who goes to work should be given to understand that he is eligible for a foreman's job as soon as he has the necessary qualifications. This gives the better class of foreign labor something to work for and a great many good foremen have come from this source, especially in the East, where the Italians have made good. In order to recruit men of a better caliber, they must be paid better wages, with an increase in rate every few months in the same ratio followed in other trades. The additional rate should go only to the most efficient men who show qualifications for promotion, and in case of failure to do so their wages should be restored to the normal rate of other men in the gang.

The best method of training a man for a foreman position is to get hustlers of a fair education, not less than

18 nor more than 25 years of age, put them with wide-awake foremen, giving the foreman to understand that he raises his own standing by his ability to train other men and that he in turn is showing his ability to his superiors so that he himself may be promoted to extra gang foreman and then to supervisor. It would not be out of place to give extra compensation to a foreman as a reward for this added service. This would also get other foremen more interested in training men under them.

A three years' training for a trackman as foreman should call for two summers and one winter on a section, the increase to come at the end of the first year. Where conditions permit the apprentice should then have six months in a yard so as to learn frog and switch work, four months on a work train so as to learn about all kinds of material, their proper distribution and handling, and the last eight months with an extra gang laying rail, ballasting and building new tracks. He should then be ready to handle any vacancy available in a safe, efficient manner, but would need close supervision by the



Attractive Homes Are an Inducement for Good Men to Become Foremen

supervisor so as to be sure he was started right. The new man should thoroughly understand the three most essential duties of a foreman, which are:

- First—The proper inspection of section at all times.
- Second—The correction in time of anything that is liable to cause trouble or damage to material used in track.
- Third—The proper direction of his forces and planning of the work with the supervisor so that all work is done at the proper time and in the proper manner.

The apprentice system has been tried on a great many roads with but little success. One reason is that these men are chosen in a class by themselves and expect more consideration than other trackmen. If all foremen were made in apprentice gangs there would be no incentive for other men to get to the front and the spirit of the gangs would be hurt. The idea of an apprentice is all right, but an apprentice gang hurts the organization as a whole. It also takes men away from their homes and keeps you from getting men who would work at locations near their homes, but not at other locations. As previously stated, I believe the best timber is the country boy, and believe if he felt sure of a position as soon as he qualified, he would try to qualify at his home location. He could then be eligible as foreman and be compensated so that he would be satisfied to leave his home station. The apprentice system may be necessary in a few remote places, but a gang of this kind should not be provided on each division.

In planning educational work it should be the idea to get men with as much education as possible to start with and add to this by study in everything relating to track

work. If lacking in education, get them to attend night school; if not possible, then to improve their education at home. The best teacher for the foremen is a wide-awake, hustling supervisor, who is not afraid to hit the leather out over the track with his foremen, directing them and correcting them, constantly improving their work, taking a personal interest in them, helping them

## As a Foreman Sees It

By T. H. PORTELL

Section Foreman, Chicago, Rock Island & Pacific,  
Des Moines, Iowa.

The training of a section foreman can be handled in several ways. The character of the location and the class of laborers employed in different districts has a decided bearing on the subject. The training in these days of heavy traffic must be done without any interference with the assigned work of the gang and when possible without any additional cost.

In the employing of an apprentice, human nature plays a big part. Laborers in the gang who are good workmen, who know track work but lack education or initiative and do not have ability to handle men or outline work, resent the employing of apprentices partly because they are paid in excess of laborer's rate and partly because they feel that the apprentice is an intruder and a rival who reduces their own chance to become foremen. This refers to the apprentice who has not had to start with any knowledge of maintenance of way work. There can be no reason for making a man already a track laborer an apprentice, for he has more to strive for as a laborer than as a higher rated apprentice, there being too small a margin between the wages of apprentice and the section foreman to be an incentive for their best efforts.

Training section foremen is largely up to the roadmaster or supervisor. Therefore, he in turn should look to his section foreman "the teacher on the job," and see that he understands that he will get better results for himself by educating the laborers he employs.

Foremen as far as possible should employ steady laborers, this being the first requisite for a good foreman. They should be made to understand that other foremen cannot be picked up to relieve them in case of sickness or vacation leave and that each of them should have at least one man in his gang who is capable of running the section and that it is part of their duties to know that the understudy is reliable and knows the work, seeing to it that such men are given the benefit of their knowledge. The man can be trained by having him take charge of the gang on such work as lining and raising track, repairing switches, etc., after which the foreman points out the errors he has made.

The roadmaster knows the prospective foremen and by letting them take charge of sections occasionally while the foremen are off duty and letting them work in terminals for short periods, in case their particular sections have only a small amount of switch work to perform, he can develop them as section foremen.

The length of time necessary to train the man for section foreman depends on several things, education, of course, playing an important part. The man nowadays ordinarily has a grade school education which should fit him to handle all the reports required of a foreman. Experience as a laborer for two or three years, even though not at railroading, broadens his education, and after a couple of years on the track, if he has shown his steadiness and a grasp of the work, the foreman can afford to give him more attention and, in another year or two prepare him to handle the section in an emergency and to receive further training from the roadmaster.

# "In Time of Peace, Prepare for War"

## Plans to Meet the Rigors of Winter are Among the Most Important Duties of Every Maintenance Officer

**W**HILE any predictions regarding the weather to be expected this coming winter are very likely to prove widely inaccurate, it is well to be prepared for a severe winter in latitudes where heavy snowstorms are frequent and with from three to five months of continuously freezing weather. The snow does not often melt in these localities, so the task of keeping tracks clear of snow and ice is one of great importance and is the greatest problem roads in the northern tier of states and Southern Canada have to contend with. Although local conditions in different localities govern the different methods of handling snow and ice it is necessary to make preparations in advance. Following are discussions by three railway maintenance officers who point out the various preparations which must be made to meet winter conditions.

### Thorough Preparation Is Important

JOHN EVANS

Division Engineer, Michigan Central, Detroit, Mich.

Before the winter season the right-of-way at terminals should be cleared of scrap, old ties and piles of dirt which accumulated in the conduct of maintenance and construction during the working season. In order that this clean-up may be completed early enough, it is important that special effort be made to complete construction and heavy maintenance work insofar as is possible before winter sets in. The interference with safe operation which is caused by the presence of piles of scrap and similar obstructions, becomes more serious with the arrival of snow and ice as their removal and disposal are often made more difficult through the existence of such obstructions.

Special attention should be given to drainage, particularly at interlockers, turntables, cinder pits and stand pipes. Ditches and tile drains should be cleaned out and obstructions which would interfere with the free movement of water to these ditches and drains should be removed. Ballast should be taken out from between ties at switches. Additional catch basins and tile drains should be put in where needed. In deciding where these are needed, a review of the previous winter's troubles will be of value.

An inspection of the water supply plants on the right-of-way should be arranged for and any leaks which would flood the tracks should be repaired. Inspections should be made for obstructions which would interfere with movement of snow flangers or similar equipment and corrections made where such obstructions are found. Low spots in tracks should be lifted out and holes where water might stand on the surface should be filled up.

Effort should be made to have the locomotive department take such steps as would reduce to a minimum the



*Winter in the Northwest.*

leakage and waste of water from engines. Inspection and test should be made on plows and flangers to determine their condition, and to be sure that the men who are to work with them thoroughly understand their operation.

Information in possession of the yardmasters for use in calling trackmen when needed should be checked to be sure that it is up to date. It may be advisable to install a telephone in some foreman's home at the railroad's expense as a help in getting men without delay when needed.

Roadmasters and section foremen should see that a sufficient supply of brooms, snow shovels, picks and salt is on hand to provide for the beginning of the winter season and that the storehouse is prepared to furnish additional supplies when needed without delay. Interlocking plants should be furnished with torches for removing ice and sleet from plates, pipe lines and connections.

### Preparation for Winter by the Bridge and Building Department

By E. M. GRIME

Supervisor of Bridges and Buildings, Northern Pacific,  
Fargo, N. D.

The officer in charge of maintenance must, as a rule, plan all his work at least three months in advance. Therefore at this season of the year in the northern sections of the country, those in charge of buildings or other structures and particularly water and coal supply should now be bending their efforts toward getting everything in shape so it will function to the best advantage during the severely cold weather of the long winter.

Water facilities especially require the closest attention at this time in order to place them in 100 per cent condition. A leaky tank or water spout attracts scant attention in the "good old summer time," but at the approach of cold weather these defects not only become very noticeable but in some cases decidedly disagreeable to enginemen or others and if allowed to exist often become a source of danger in more ways than one. The water column valve which operated nicely during the summer, if not gone over and thoroughly cleaned of any slight incrustation may stick and cause a serious delay just when most needed. While cleaning the water column make sure that the sewer from the pit is in proper work-

ing order, also that the cover on the pit and on the frost deck beneath fits properly so it will keep out the cold. If the pit is one where, in spite of all precaution, there is a tendency to freeze, place a short length of pipe through the deck and projecting a few inches above to which a steam hose from a locomotive steam dome or from the pump house, if adjacent, may be applied for thawing purposes. Also do not overlook having the necessary steam hose on hand at the water station for use in cases of emergency.

The frost chamber around the riser pipes at the water tank should be in good repair with tight-fitting triple doors. If water is taken infrequently a stove in this chamber with a pipe extending up through the tank may be necessary so it can be warmed up once or twice a week but usually a good sized lantern kept burning in the frost chamber during the coldest weather will be sufficient. Be sure the frost chamber is tight at the ground line wrapping tarred felt paper tightly around the base with the lower edge buried in the ground or if the frost chamber is getting old and rather loose, bank it with manure to a height of several feet. When treating tubs rest on blocking a few feet above the ground banking up around the base is desirable to avoid an accumulation of ice on the bottom of the tub. See that the sewers from these treating tubs are open and have a free outlet for the disposal of sludge. Examine the intake well and remove mud or debris that may have accumulated during the summer. If at a treating plant, sludge may have accumulated in the storage tank it should be flushed out to avoid possibility of its being drawn into the pipe lines or water column when the water gets low. See that targets are registering properly and that the floats are in working condition. Have the coal bin at the pump house filled to capacity so the handling of coal may be avoided during the cold weather when the operating department has enough trouble without this kind of work.

Next in importance are the coaling stations. The coal dock which gave no trouble all summer has an exasperating way of breaking a chain or gear when the weather gets cold. When the oil gets stiff and lubrication is not so good naturally everything works hard and the strain on all parts is increased. Therefore, each dock should be given a thorough overhauling early in the fall and chains, ropes, belts, gears, bearings, oiling features, etc., repaired or renewed as required. A few dollars spent now may save hundreds in the case of a breakdown under severe weather conditions. Be sure that lining iron in pockets and chutes is in good condition and that the gates are in proper working order so the coal will flow smoothly.

Of equal importance are the engine house facilities which should all be given special attention at this time. Heating arrangements should all be put in the best of condition and at terminals the stationary plant may need particular attention to be sure it is ready for the extra load that will be put on it. Engine house doors and fastenings should all be gone over and repaired where necessary, windows made tight, pointing done around the frames to stop air leaks, and storm windows applied. Smoke jacks should be put in first class shape. An engine house at best is a hard place for men to work and too much attention cannot be given to proper heating and ventilation in the winter season.

The fuel used for heating depots and other buildings is no small item of expense. It is, therefore, important to insulate these buildings as well as possible by storm windows and doors and take pains to see that they are as tight as possible around the base. All heating facilities should be given special attention not only that they

may operate efficiently but that some degree of comfort may be had by patrons and employees. The oftentimes rather indifferent and usually scant attention which these facilities receive makes it necessary that they be as nearly fool proof as possible and particular attention should be given to protecting all the surroundings against the hazard of fire. In steam plants, radiator valves and vents should all be tested, grates, smoke pipes and dampers should be repaired or renewed if necessary, and valves by which a careless employee might inadvertently drain the boiler and cause damage, should have handles removed so they can only be opened by the use of a wrench.

In the northwest snow fences require a good deal of attention each fall on account of damage done by windstorms and grass fires during the summer and these should be put into first class shape before the snow flies.

While the bridges are maintained at practically 100 per cent at all seasons, in the fall it is advisable to check up the places where summer freshets may have deposited brush and other debris against pile and timber trestles. Such accumulations create a bad fire hazard and may easily be the cause of an ice jam with consequent serious damage in the spring. This debris should all be removed before the ice forms and while it can be floated down stream.

## Getting Ready for Winter Work

By J. W. POWERS

Supervisor of Track, New York Central, Rochester, N. Y.

Early each fall a meeting of all officers concerned is necessary. A program should be prepared at this meeting, with detailed instructions regarding the removal of snow and measures to be taken to keep the tracks in service during severe storms. Thorough organizations enter very largely into the successful program. Each officer should be thoroughly familiar with what is expected of him and his men and what tools and equipment he is responsible for. After this meeting the supervisor should hold a meeting with those under his charge and should give detailed instructions similar to those decided upon during the previous meeting regarding the removal of snow and the measures to be taken to keep the tracks in service during snow storms. In these instructions he tells where all special material, such as flangers, snowplows and spreaders, may be found and every foreman should be assigned to a certain place at the beginning of a storm and every one should do the work allotted to him. By following the program as outlined, it is not necessary to organize forces and hunt up material after a storm arrives, causing delay and more or less confusion in beginning the work, but each gang takes up its assigned task as a matter of routine work.

We have learned from past experience to be prepared in time. With this end in view snow equipment is repaired during the summer months and placed at required points, where repairing and testing are done at the division car shops, but in addition to the repairs and tests made by the car department, a representative of the maintenance of way department should inspect and test the machines after they are returned to the supervisor's headquarters as a precautionary measure, to make sure that they are in perfect condition. After this test, if found satisfactory, they are placed on tracks where they will be easily accessible when needed.

This equipment must be provided with tools, such as brooms, shovels, lanterns, salt, picks, etc. Tools and equipment used vary on railways, but a supervisor in charge of a snow territory should have a sufficient supply of tools and equipment of the most suitable types needed.

In early winter, before snow or frost comes, portable snow fence should be placed to the best advantage, according to the experience of former years.

The proper location for snow fences, both portable and permanent, is of utmost importance. Improperly placed snow fences may cause obstructions to traffic, where little or no trouble would exist if the fences were removed. While the cost of widening cuts by steam shovel, ditcher or other equipment may be greater than the placing of snow fences, still the permanent results obtained by the former method prove more satisfactory and economical in most cases. Only men who are thoroughly familiar and competent to handle snow equipment should be entrusted with the use of it. They should have a thorough knowledge of the territory to be covered. They should be given an opportunity to familiarize themselves with any obstructions that would not clear snowplow wings and where it is necessary to raise flangers.

At the first signs of snow all private crossings that are not used during the winter months should be taken up and all obstructions to flangers between the rails that are not needed, should be removed. Snowplow and flanger signs should be erected at points where there is anything that would interfere with the operation of flangers or wings of snowplows.

Snow will be encountered in many forms, the most common of which is drifted snow, but it is almost equally difficult to contend with it when it fills the flanges of the rails with ice, or upon melting fills the track ditches and flows across the track, covering the rails with ice and threatening derailment to the first passing train. Therefore, we must be prepared to handle it in all forms and its removal constitutes one of the main items of cost of track maintenance.

Generally it is an easy matter to keep the track clear, for the first few storms give little trouble and the use of flange cars are sufficient, but track should be flanged out and winged out, if necessary, before the snow becomes so deep that brake beams and other parts of the running equipment drag in the snow, causing a reduction in the tonnage that engines can haul. Besides if snow is neglected weather conditions may become such as to tie up the road. Therefore, Russell flanger and wing snow plows should be put in operation as soon as it is deemed necessary and should be run at a speed to enable them to throw the snow several feet away from the edge of the cuts. When snow becomes too deep for the wing plows it is sometimes necessary to use a rotary. Many cuts can be widened quickly by the use of a spreader.

When the long continued severe midwinter storms arrive, the battle of fighting snow begins. It is sometimes necessary to employ temporary forces of laborers and men must work in relays both day and night. It is well to mix the permanent employees with the temporary forces. Much more work can be accomplished in this way and the old employees will protect the new ones from liability to injury, which is an important factor in fighting snow. Occasionally it becomes necessary, during very severe storms, to abandon freight trains and all efforts are directed to keeping the lines open to passenger traffic and to do so it is sometimes necessary to run snowplows ahead of each train, using two or more engines to push the plow.

Between storms the struggle goes on making preparation for the next one. Clearing snow and ice in yards is a large item of expense. Therefore, mechanical means should be used wherever it is possible to do so and manual labor should be reduced to a minimum. A double track Russell wing plow will serve the purpose very well. This will push the snow sideways from track to track until

they are finally cleared. Of course if there are too many tracks, it may be necessary to block one by piling the snow on it from the adjacent tracks. Then it will have to be loaded on cars either by hand or with clam shells. Perhaps the most economical way to remove the snow is with a rotary plow. By working slowly cars placed on an adjacent track can be loaded with very little snow falling on each side. A rotary plow will also throw snow over several tracks and can be used advantageously for clearing tracks in yards.

A leveler can also be used to clear tracks in the same manner as described above. In order to pursue the method outlined it is necessary to clear at least two adjacent parallel tracks of all cars before such a process is started and to proceed in the same manner shifting cars to the clean tracks as the cars are removed from the tracks yet to be cleaned of snow. Loading snow on to cars by shovel and carrying it from the yard by train is sometimes necessary, but always expensive. If this method is used to any extent the snow should be loaded onto flat cars and plowed off on a trestle.

Keeping the switches free from snow and ice is very important in handling a severe snowstorm as it facilitates the free and uninterrupted movement of trains from one track to another particularly at interlocking plants. Trains, if compelled to stop, might become stalled making it necessary to dig them out. It is sometimes difficult to keep the switches open especially in a ladder track where the wind and equipment will fill them up quickly after the snow gets four or five inches or more above the rail. The snow may be removed from a ladder track down to the top of a rail by pushing long switch ties ahead of a truck of a loaded car similar to the method employed when unloading ballast. Blow torches and hydro-carbon are now used extensively for removing snow and ice from switches. Gas and electric heaters are also used to some extent and have proved economical and satisfactory especially at interlocking plants.

If in the fall a tall stake is driven at each end of a culvert opening there will be no trouble locating it when the culvert is completely covered with snow.



The Steam Shovel, a Necessity in Modern Railroading

# Bridge and Building Men Study Western Timbers at Close Range

Convention at Seattle, Wash., Preceded by Inspection of Logging,  
Saw Mill and Treating Operations

**M**EASURED by its educational value, the thirty-third annual convention of the American Railway Bridge and Building Association, which was held at Seattle, Wash., on October 16-18, was the most successful in the history of that organization. This was due in large measure to the opportunity afforded the members to visit the woods and sawmills enroute to the meeting.

More than one hundred members of the association, who, with their families, comprised a party of over two hundred persons, left Chicago on October 6 on a special train of 12 cars, provided by the Chicago, Burlington & Quincy, the Denver & Rio Grande Western and the Union Pacific.

The party stopped at Lincoln, Neb., to inspect the concrete pipe and pile plant of the Burlington; at Denver, Colo., to visit the new shops of the Burlington; at Ogden, Utah, to study the Salt Lake trestle of the Southern Pacific; and at Baker, Ore., to go through a sawmill cutting white pine timber. On arrival at Portland, Ore., a visit was made to the sawmills and creosoting plant of the Charles R. McCormick Co. at St. Helens, Ore., and on the following day the party was taken over the Tillamook branch of the Southern Pacific, where visits were made to logging and lumbering operations. A day was also spent at Tacoma, Wash., where the party was conducted through the sawmills of the St. Paul & Tacoma Lumber Company, and opportunity was afforded for the study of attacks of teredo on the piling supporting the docks of the Chicago, Milwaukee & St. Paul.

## Opening Exercises

More than 200 members were present when the convention was called to order Tuesday morning by J. S. Robinson (division engineer, C. & N. W.), first vice-president of the association, who presided over the sessions of the convention in the absence of President Arthur Ridgway (chief engineer, D. & R. G. W.).

In welcoming the association to Seattle, R. J. Middleton, assistant chief engineer of the Chicago, Milwaukee & St. Paul, called attention to the fact that this was the first time that this organization had met in the Northwest and the second time that it had met west of the Rocky mountains. He described the timber resources of this area and stated that Oregon and Washington had the largest stand of timber of a single species in the world. He also referred to the railroad and steamship terminal facilities at Seattle and stated that the two largest pier-type ocean terminals are in this port. In conclusion, he referred to the period of readjustment through which the railways, in common with other industries, are passing and urged that the members of the association should not content themselves with doing their departmental work well, but should also exert themselves to restore the old-time spirit of loyalty among the rank and file of their employees.

In responding to Mr. Middleton's address on behalf of the association, J. P. Wood, supervisor of bridges, Pere Marquette, referred to the fact that the members of this organization had come west because of their de-

sire to study the timber resources on the Pacific Coast and to learn more about the timbers from this area which they are now beginning to use in increasing quantities.

The chairman then introduced Macy Nicholson, general manager, Chicago, Milwaukee & St. Paul, Seattle, Wash., who spoke in part as follows:

## The Relation of Employees to the Public

By M. NICHOLSON

General Manager of the C. M. & St. P.

We wonder sometimes if the thoughtless traveler or shipper recognizes how essential a partner you are in public existence. Possibly some do, but fail to give evidence of it. When we have some calamity caused by floods, cyclones, etc., which cause the collapse of an important structure and delays the movement of the public's property and persons for several days, the few who have a close-up view of the heroic efforts put forth to restore the damaged link in the chain give temporary evidence of appreciation, while those not immediately interested wonder if there was not some serious neglect on your part that contributed to the inconvenience of the public during reconstruction. It is quite natural that too many of our people take a critical view rather than a supporting attitude. Possibly this condition of affairs has been brought about by our modesty in not making our "relation to the public" better known.

During the development of our railroads they were real brothers of the farms, factories, wholesale houses, cities and villages, recognized as a senior partner in all enterprise. The creative efforts of the partnership produced a prosperity that was healthy, substantial and the envy of people from all lands of the earth. People from foreign countries flocked to the United States to secure employment and make their permanent homes here. Their savings were invested in one or the other of the partners, railroads or industry. Thousands bought bonds and stocks of our railroads, boosted for the companies they invested in, and, aside from a few disappointments, were rewarded for their confidence and material support of the roads. This continued while the roads were able to control their own business and be a real partner of the business man and investor. The railroad men ran the railroads, the farmer the farm, the manufacturer his factory and the storekeeper his store.

How is it today? Entirely different, so far as the railroads are concerned, although our relation to the public remains the same as to functions. Discontented persons in our midst, ambitious to live without doing their part in constructive creation, took advantage of a chance to live off the endeavors of others. Propaganda appeared suggesting a "regulation" of this partner in the business who was the work horse transporting the fruits of commercial endeavor.

Regulatory bodies gradually grew in power from support of those desiring to live off the public treasury and from the fruits of industry until such restrictions surround our railroad operations so that there is little left for officers to do except carry the burden of responsi-

bility without any authority. These commissions have established standards, rules for operation, methods of accounting, frequency of service, facilities of the plant, the sale prices for our service and the maximum of revenue to be earned.

Some people, and it is usually the ones less directly affected, advocate complete government ownership and operation of railroads, but surely no one who has given much study to the subject can endorse it. Our government structure is now so expansive that the cost has burdened everyone to the limit. We are now, through public taxes, supporting 1 out of every 20 voters with their families at an annual expense of nearly five billion dollars, while immediately before the world war the ratio was 1 in 300 at a much smaller expense.

Possibly you have a solution of your own, but I want to state in a few words what might solve our difficulties. Remove all federal, state and other restrictions on the operation of railroads and let the owners, who are millions of our own people, through the experts whom they have selected to manage their property, run the railroads the same as a farmer runs his farm, a sawmill owner runs his plant or a merchant runs his store. Our business is important enough to require specially trained men in all departments and our service is sold to buyers of transportation. Our success depends upon our ability to sell at a price that will satisfy the customer. Our ambition is to expand and to create more business and not discourage traffic.

Our relation to the public is well established, but possibly neglected a little. Our duty now is to assert our position, point out to the public the needs of our railroad structure and ask that we be allowed the same right of existence that any other institution has.

The late President stated a policy which, if followed, would be an all-wise one: "Let there be more business in government and less government in business." We have become dissatisfied with an over-government of business. Is it not our duty in our relation to the public to take part in the recovery of our government and insist on repairing the house we live in so it will be managed by elected representatives of the people who provide the means of support and not by those who only live

upon the taxes taken from others? You are builders and have a prior claim on the right to rebuild our government structure. Is this not an enviable "Relation to the Public"?

## The Railways As an Investment

In an address on Railway Companies and the Investing Public, which was presented on Tuesday afternoon, G. T. Reid, vice-president and western counsel of the Northern Pacific, outlined the considerations which prompt a person to buy railway or other securities. Opening with the statement that but for the inventive genius of the world we would still be living as savages, he paid a tribute to those men who, through invention of refinement of processes, have reduced production costs and thereby enabled people to enjoy privileges not otherwise obtainable. He pictured the reduction of expenses in an industry as basic as transportation as a patriotic contribution. He stated, however, that the railways cannot develop solely through reductions in their costs, but must also attract new money if their facilities are to be extended to the extent necessary to keep pace with public demands. He cited the more than 38,000 stockholders of the Northern Pacific and the more than 45,000 stockholders of the Great Northern, with even larger numbers of bondholders, as indicative of the wide distribution of the ownership of the railways. Investment in a railway or other property is prompted either by the hope of large profits (usually represented by purchases of stock) or by ample security (as represented in bonds). Railways require more than a billion dollars of new money annually, and this money can be secured only from the accumulated savings of the people. If the roads are to secure the funds they require for their development, their securities must compete with those of other industries and must be equally attractive.

Judge Reid concluded with the statement that transportation must be adequate for a nation's needs if that nation is to develop. He urged the co-operation of every employee in curbing the attacks which are now being made on the roads, in order that they may be able to sustain themselves and serve the nation properly.

## Concrete Tanks for Railway Water Service

By C. R. KNOWLES,

Superintendent Water Service, Illinois Central, Chicago.

[The following is an abstract of a paper presented by Mr. Knowles at the Bridge and Building convention.]

The first concrete water tank built in the United States was a standpipe constructed at Little Falls, N. J., in 1899. What was probably the first concrete tank used in railway water service was constructed 10 years later by the Spokane, Portland & Seattle. Other railroads have constructed concrete water tanks from time to time until at present about 25 are in service in America.

There are over 20,000 railway water tanks in use on the railroads of the country, and the renewals and new tanks run from 800 to 900 each year; yet concrete tanks represent such a small percentage of the total as to be almost negligible. In an effort to determine the reasons for this limited use in water tanks the following questions suggest themselves:

- 1.—Is it due to failure to secure water tight tanks?
- 2.—Is there some inherent fault in concrete that makes it unsuitable for the construction of water tanks?
- 3.—Is it due to the fact that no uniform satisfactory design of tank has been produced?

- 4.—Is it due to lack of permanent location for tanks?
- 5.—Is the first cost prohibitive?

### Leakage of Tanks

Leakage has been one of the biggest problems that designers and builders of concrete tanks have had to contend with and it is still a much mooted question as to the proper method of securing a water-tight job. There are only two reasons for leakage through concrete—cracks and poor concrete.

Cracks may be due to shrinkage of the concrete in setting, or to expansion or tension due to the pressure of the water in the tank. Cracks may also be formed in joints where pouring is not continuous.

By poor concrete is meant a porous concrete due to improper proportions of cement and aggregate, poor mixing, too much water or placing the concrete without properly spading it in place. Rupture of the concrete through removing the forms while the concrete is green may develop either cracks or porous concrete.

Leakage through concrete tanks is of minor importance

so far as the loss of water is concerned, the principal objection being the action of frost, which may cause the concrete to break off and expose the reinforcing to rust.

It is not always possible to prevent cracks in concrete but waterproofing applied as an integral part of the concrete is of questionable value as a preventative of porous concrete and of no value as a preventative of leaks through cracks or joints. The prevention of cracks and resultant leakage is a question of both design and workmanship, waterproofing coming into play only when design or workmanship have failed of their purpose. It would appear, therefore, that efforts to find a satisfactory method of waterproofing concrete tanks are secondary to securing a design of tank that will eliminate or overcome shrinkage stresses, resulting in large or small leaks or tension on the concrete, independent of the reinforcing.

Hydrated lime is frequently used as a waterproofing material in concrete and while there is no doubt that the lime results in a denser concrete the principle advantage is probably due to its effect in making the concrete flow smoother and making spading easier.

The Portland Cement Association insists that proper construction will result in an impermeable concrete. Its comments are as follows:

"Concrete made from properly selected aggregates, combined with portland cement in suitable proportions, when thoroughly mixed to the right consistency, carefully placed, and adequately protected during early hardening, will be watertight under all ordinary conditions.

Watertight concrete means good concrete. A few fundamental principles of good construction should be carefully observed. These can be summarized as follows:

1.—All portions of the structure should be strong enough to resist the head of water, either internal or external, to which the concrete may be subjected.

2.—Use clean, well graded aggregates.

3.—Use a relatively rich mixture, a 1:2:3, or better 1:1½:3.

4.—Use the minimum amount of mixing water that will give a workable, plastic consistency; not over 6 gal. per sack of cement.

5.—Mix the concrete thoroughly, at least 1½ min. in a batch mixer.

6.—Place the concrete carefully in layers 6 to 12 in. deep, spading or rodding it thoroughly to prevent the formation of stone pockets or voids.

7.—If possible place the concrete in one continuous operation to avoid construction joints. If placing is interrupted, be sure to get a good bond between the fresh concrete and that placed previously.

8.—Keep the concrete warm and damp for the first 10 days.

These principles of good concrete construction are all emphasized in the progress report of the joint committee on standard specifications for concrete and reinforced concrete, issued in June, 1921. Failure to observe these principles may result in unsatisfactory, porous concrete; care in applying them will give strong, impermeable concrete.

In tests conducted by the U. S. Bureau of Standards, thin slabs of a lean (1:6) portland cement mortar and 1:1½:2 concrete

were subjected to a water pressure of 60 lb. per sq. in. This pressure is equivalent to a 138-ft. head of water. Although water penetrated through 1¾ in. limestone slabs in periods ranging from 20 sec. to 20 min., it took 3½ hrs for water to penetrate through a 2-in slab of 1:6 mortar, while at the end of 24 hrs., when the test was terminated, the 2-in. slab of 1:1½:2 concrete was still dry."

### Suitability of Concrete for Tanks

While the use of concrete tanks in railway water service is a radical departure from wood and steel tanks, there does not appear to be any good reason why it should not prove satisfactory for this purpose if properly designed and constructed. The results obtained upon the Central of Georgia and the Duluth & Iron Range indicate that concrete tanks have proved successful, at least from the standpoint of utility. It is apparent from the experience of these two

roads that there is no inherent fault in concrete that will render it unfit for the storage of water if proper construction methods are followed. It would also indicate that climatic conditions offer no insurmountable problems. It may be possible that these tanks will develop faults in time that are not yet apparent but it is improbable, as one road has had a concrete tank in service 12 years and the other 7 years, which would seem to be sufficient time for inherent defects to develop in either case.

There is no doubt that the concrete tank has many points of argument in its favor, chief among which are the following:

1.—The materials of which it is constructed are readily obtained in almost any locality.

2.—It can be so designed that it will be ornamental or in keeping with other structures.

3.—When properly constructed there should be practically no expense for maintenance.

4.—Where properly located it is a permanent structure.

5.—It is fireproof and under most conditions proof against the elements.

### Design

Concrete water tanks constructed on American railroads to date have followed four general designs, so far as the tower, floor and walls are concerned.

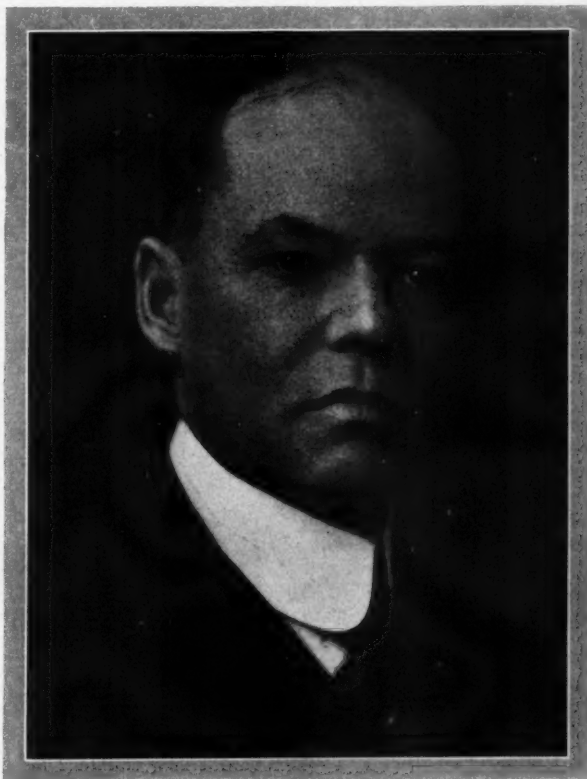
1.—The standpipe type of tank with the floor or bottom of the tank at or near the top of rail and utilizing the entire height of the structure for the storage of water.

2.—A cylindrical shell forming both the tower and walls of the tank with a diaphragm or floor placed at the desired height in the shell with a central pier or column to assist in supporting the floor. In some cases the central column has been eliminated, the floor being made self-supporting in the center.

3.—A cylindrical shell as above, forming both the tower and walls of the tank and a hemispherical bottom.

4.—A tower consisting of columns and a floor system of beams supporting a flat bottom and straight cylindrical walls.

The lack of a uniform design of concrete water tank that would overcome the existing faults resulting in cracks



Arthur O. Ridgway  
President

in the concrete, seepage and other leakage, has probably reacted against the concrete tank as much as anything else. A standard uniform design of tank would undoubtedly result in materially reducing the cost of construction and would bring this type of tank into closer competition with tanks of other types. The concrete tanks that have been erected represent nearly as many different designs as there are tanks, with the result that it is almost impossible to make a comparison of tanks under varying conditions of service, while an intelligent estimate of costs is practically out of the question.

Some designs have apparently overcome one fault only to develop another. Practice on different railroads varies widely as to design of tower and tank, thickness of floor and wall, reinforcing and method of placing, forms, mix, aggregate and method of construction and until some design of tank is developed and adopted that will be uniform, at least in general principles, progress will necessarily be slow.

#### Permanent Location of Tank

In the development of a railroad property it is frequently necessary to move water tanks, and from the nature of their construction concrete tanks cannot be moved. Thus, the permanence of the concrete tank, while used as the principal argument in its favor, is at the same time one of the principal objections to its use in many cases, for while it is undoubtedly permanent in every sense of the word, there is always a question as to the permanence of the railroad, in location at least, and changes in road may take place that will result in the concrete tank becoming useless within a few years. Where a steel or wooden tank could be moved to a suitable location at considerably less than the cost of a new tank, the concrete tank is not only useless but will probably entail considerable expense for wrecking.

As an example of the changes that occur in the location of water tanks, a study of 540 tanks in service on a middle western railroad shows that the location of only 56 has remained unchanged in 25 years. While, of course, many of these have been renewed on account of age it has been advisable to change their location in frequent instances.

Therefore, the erection of a concrete tank is inadvisable unless the location is known to be permanent beyond the possibility of a doubt. Thus, in many cases where the territory traversed by the railroad is not fully developed or where the water stations and line of road are not firmly established, a concrete tank cannot be considered as a serious competitor of steel and wooden tanks.

#### Cost of Concrete Tanks

From the best figures available the cost of a 100,000-gal. concrete tank erected prior to 1918 ranged from \$5,000 to \$7,500. In all probability these tanks would cost considerably more at the present time. Estimates received in 1920 from a contractor making a specialty of concrete tanks placed the cost of a 100,000-gal. tank of the cylindrical type with an over-all elevation of 62 ft. between \$8,000 and \$10,000. The cost of a 100,000-gal. steel tank varies from \$5,000 to \$5,500 and of a wooden tank of redwood or cypress from \$4,000 to \$4,500. The cost of concrete tanks has limited their construction on railroads.

#### Conclusions

It has been demonstrated conclusively that it is possible to produce concrete that is impervious to water, at least to the extent required in a railway water tank.

No inherent fault has developed in concrete that would make it unfit for the storage of water and there

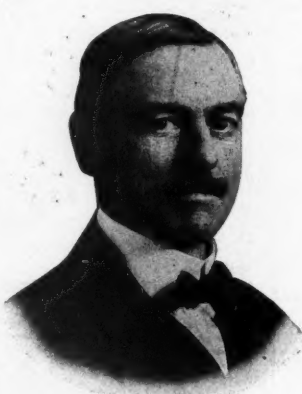
does not appear to be any reason why it should not prove satisfactory for this purpose if the tank is properly designed and constructed.

There are certain features in the construction of concrete tanks that will have to be given further consideration, however, before the concrete tank can be considered with tanks of other types, chief among which is the question of design. It is not the thought that a standard design of tank should be adopted to fit all conditions but certain principles of design will have to be agreed upon before the concrete tank will come into general use.

The difficulty in establishing a location that will be permanent and that will fit in with the development of a railroad property is one of the principal obstacles to the adoption of concrete tanks and their construction will be limited to installations where the location is known to be permanent beyond a doubt.

The first cost is another serious handicap to this type of tank, as the investment required does not compare favorably with that of other types of tanks in spite of their acknowledged permanence and low cost of maintenance.

While the concrete tank will no doubt in time find its place in railway water service, it has not yet been developed to the extent that it can be recommended for



C. H. Lichty  
Secretary-Treasurer



F. E. Weise  
Assistant Secretary

general use. This statement is not based upon any specific objection to concrete as a material for water tanks, as no fundamental objection may be offered against its use for this purpose.

#### Discussion

In discussing this report, D. A. Tomlinson (Portland Cement Association) stated that over 600 concrete oil storage tanks are in service. As oil is lighter than water, tanks which are watertight are not necessarily oiltight, while tanks which will hold oil will of necessity hold water. More than half of these concrete tanks received no special waterproofing treatment during construction. Mr. Tomlinson stated further that concrete properly designed, mixed and protected during seasoning should not crack. Hair cracks are usually caused by too rapid drying. If concrete is kept moist during the first 10 days, not only will hair cracks not appear but the strength of the concrete will be increased 65 per cent.

Where necessary to stop concreting for any reason, tight joints can be secured by (1) cleaning off all laitance thoroughly down to solid concrete, (2) chipping or roughening the surface, (3) applying a cement mortar of the consistency of thick cream, and (4) placing the

new concrete immediately on this. An expedient sometimes adopted is to form a key by embedding a 2 in. by 4 in. timber vertically in the concrete when quitting work at night and removing this before starting the next run of concrete in the morning.

In a discussion submitted by letter, C. E. Weaver (C. of Ga.) stated that too much stress cannot be placed on the importance of securing concrete of the maximum density. While he used an integral waterproofing material in the concrete water tanks built on that road, he is thoroughly convinced that a waterproof concrete can be made which does not include anything but plain concrete

of maximum density. On the other hand, integral waterproofing can be used in the concrete and still not make a good watertight job, if other requirements for making good, dense concrete are not strictly adhered to.

It is of the utmost importance that the tank be made watertight at the start, as it is very difficult to correct a leaky condition after the tank has been built. While, as stated in the report, the principal objection to leaky tanks is on account of the frost action in the North, there is a great objection to leaky concrete in any climate, as leaky concrete will eventually disintegrate under the chemical action of the water and its ingredients.

## Concrete, Cast Iron and Corrugated Metal Pipe Culverts

[A committee report on the relative merits of three materials commonly used in culvert construction was presented before the convention.]

A pipe culvert is a structure of circular or nearly circular cross section located in a railroad embankment below subgrade for the purpose of carrying the flow of a small stream through the embankment. The replacement of a pipe culvert in a railroad embankment generally necessitates very heavy expense for supporting traffic,

to a light and shallow headwall. Where the ground is easily eroded, an apron construction in the form of stone or concrete paving, forming a continuation of the culvert on its downstream end, is recommended.

### Cast-Iron Pipe

The sizes of cast-iron pipe generally used range from 12 in. to 48 in. in diameter, although occasionally larger sizes are employed for cattle passes, running to 60 in.



**J. S. Robinson**  
*First Vice-President*



**J. P. Wood**  
*Second Vice-President*



**C. W. Wright**  
*Third Vice-President*



**E. T. Howson**  
*Fourth Vice-President*

excavating and replacement of embankment, or for tunneling, this expense usually being materially in excess of the cost of the culvert itself. Consequently, an engineer is justified in giving special consideration to the selection of a culvert which will remain permanent and provide for future as well as present conditions of drainage and railroad traffic. Comparative costs have been considered of minor importance in this report, as it is felt that permanency is the main purpose to consider in culvert construction and that comparatively small differences in first cost are of relatively little importance.

In the past it has generally been the practice to provide a pipe culvert with headwalls at both the upstream and downstream ends. These headwalls serve (1) to prevent the washing of the embankment around the ends of the pipe, and (2) to act as a retaining wall for the embankment so as to prevent sliding, which may pull the pipe apart at the joints. In the latter respect, the headwall is a menace rather than a protection unless it is built of adequate section and carried to sufficient depth of foundation that it will properly resist the thrusts from the embankment. The use of riprap or other forms of bank protection will prevent scouring and they are preferable

and 72 in. in diameter. The pipe generally used is of the bell and spigot type, and on most railroads it is the practice to lay the pipe with open joints. In some cases, however, the joints are cemented or calked with oakum or packed with clay.

In the long service of cast-iron pipe, failures have been few. Breaking or crushing of the pipe under load is exceptional. Failures due to settlement are more frequent, but they are generally caused by insufficient foundation and the pipe itself is not at fault. Failures due to corrosion are infrequent and occur only at locations where the water is badly contaminated with acids, particularly in coal mining regions.

Slipping of the joints occurs where the embankment is sliding. Probably conditions of this character are most frequent where an additional embankment has been placed for a second and third track with the fill deposited directly on the old slope. Such slipping is reported by roads using cemented as well as open joints, indicating that probably the additional adhesion provided by filling the joints with cement is not of material benefit. The most common remedy where movements of this character occur is to place rods on the inside of the pipe



The Bridge and Building Men at Denver

sections, fasten these rods to the two end sections and pull them up with bolts or turnbuckles.

Special types of cast-iron pipe are on the market which provide a more definite bond between the pipe sections with the object of avoiding slipping at the joints. Probably the most common type of this pipe is one which has lugs placed inside of the bell at one end and outside of the pipe section at the other end for part of the circumference. When the pipe is in position these lugs pass by each other and one pipe is then rotated until the lugs grip. Reports on this type of pipe indicate satisfactory results, with occasional difficulties in making the lugs grip on account of mechanical imperfections.

#### Pre-Cast Reinforced Concrete Pipe

The most common sizes of pre-cast concrete pipe range from 18 in. to 48 in. in diameter. Sizes as small as 12 in. and as large as 60 in. and 72 in. in diameter have been used, while a special oval type of 84 in. diameter is manufactured for cattle passes.

Most of the pipe manufactured by outside concerns is of the bell and spigot type and the arrangement of the joints is similar to that of cast-iron pipe. The pipe is usually made in lengths of 4 ft. or 6 ft.

The permanency of reinforced concrete pipe depends not only on initial strength, but also largely on the workmanship. An inner surface impermeable to water is essential, for if the concrete is porous, frost action will cause spalling, ultimately exposing the reinforcement, and failure may soon be expected. It is likewise necessary that the forms be kept on sufficiently long before stripping to allow for the initial set and also that the shipment of the pipe be deferred long enough to give the necessary strength to it so that breakage in handling will not occur. Past experience has shown that considerable quantities of concrete pipe have been broken during shipment and in unloading, due to insufficient curing, and that hair cracks have developed in the concrete on account of handling the pipe too soon. Such cracks later extend and cause failure. Where the bell and spigot type of joints are used, it is the practice of the railroads in most cases to cement the joints.

Failures of concrete pipe have been very few. Some breakage has occurred due to improper handling before placing and not allowing enough time for curing. Very few failures due to settlement are reported. Some disintegration due to frost action has been experienced, but this was started by hair cracks developed on account of insufficient curing. Slipping of joints occurs in a few cases under conditions where movement takes place similar to that with cast-iron pipe.

#### Corrugated Metal Pipe

This type of pipe is usually manufactured in sizes ranging from 12 in. to 48 in. diameter. The better grades of material used come as close to pure iron as possible. Ordinary commercial steel is undesirable for

culvert material on account of its rapid corrosion. The thickness of metal varies from No. 16 to No. 10 gage, increasing with the diameter of the pipe.

The advantages claimed for this type of pipe culvert are the definite longitudinal bond which prevents joint slipping, the flexibility of the section as a whole, which permits it to conform to local settlement without breakage, and its light weight, which permits easy handling and shipment. Nearly all railroads which have had this type of culvert in service for any length of time report failures. While in a number of cases these failures represent a small percentage of the installations, cases are also reported where failures have been rather high.

In general, the experience with the corrugated metal culvert has not been sufficiently extensive to permit a definite conclusion to be formed regarding its merits. A large variation in the chemical composition of the metal made by the various manufacturers, the lack of knowledge of the local conditions under which installations were made, and the character of material employed in such installation, makes it impossible to form a definite conclusion as to the value of the materials offered by the various makers and the conditions under which they may be used in railroad embankments, with an assurance of permanency.

#### Conclusions

Cast-iron pipe and reinforced concrete pipe are satisfactory materials for culverts. The first cost of installation of reinforced concrete pipe is in most cases less than for the cast-iron pipe. The life of the two kinds of pipe, where properly manufactured and installed, may be expected to be nearly equal. The choice between these two types will, therefore, be determined largely by local conditions and the question of economy. On a number of railroads cast-iron pipe is preferred where it is located close to the track, such roads usually specifying a minimum depth of 3 ft. below base of rail to the top of concrete pipe. The tendency of most railroads at this time is to use concrete pipe because of its lower cost of installation.

Under ordinary conditions, corrugated metal pipe is not as dependable. Neither is it expected to give the same life as either concrete or cast-iron pipe, and from present experience it is not believed to be capable of resisting heavy loads to the same extent as the other types mentioned. Its use under a railroad embankment may be justified under special conditions where difficulties of transporting heavier types of pipe are great and the traffic to be carried is light. In such cases, consideration should be given to possible future renewal if failure occurs. The safe procedure would be to install a pipe of this character of somewhat larger section than required for the waterway, so that additional support could be placed inside of the pipe in case signs of failure develop. The use of corrugated metal pipe is justified in construction of a temporary character, for cross drains of small di-



A Visit to the Burlington Shops

ameter located between the ties close to the track-level, and also for drainage under farm roads and lightly traveled highway approaches. The experience in regard to its use in railroad embankments is too limited and too much of an experimental nature to warrant a definite recommendation.

[The report was signed by A. B. Scowden (B. & O.), chairman; C. S. Heritage (K. C. S.), vice-chairman; H. A. Gerst (G. N.), R. H. Reid (N. Y. C.), F. W. Hillman (C. & N. W.), R. W. Johnson (C. M. & St. P.), J. S. Lemond (Sou.) and W. L. Ratliff (I. C.).]

#### Discussion

In presenting the report of this committee, Chairman A. B. Scowden stated that while a number of roads had reported failures of corrugated metal culverts, he had been unable to secure any specific information regarding the character of metal, gage, etc. He also stated that many of the defects which led to the earlier failures have been corrected in later designs. The report as presented by the committee was based upon information furnished by the roads, some of which has been refuted by recent investigations.

D. A. Tomlinson (Portland Cement Association) described a concrete pipe culvert which was installed on the Memphis division of the Louisville & Nashville in 1858 and which is still in service and in good condition. C. R. Knowles (I. C.) emphasized the danger of corrosion of cast iron or other metal pipe laid in cinders and stated that when laying water pipe in such materials he coated it with 6 in. of clay. T. B. Turnbull (Ann Arbor) stated that he has used corrugated pipe up to 36 in. diam-

eter for 12 years for distances up to 12 ft. below the base of the rail. H. I. Benjamin (S. P.) reported a number of failures of corrugated pipe in streams carrying alkali in southern California, but reported that corrugated pipe will be used in shallow fills on the Natron cut-off now under construction. N. Johnson (C. G. W.) stated that corrugated iron culverts are used extensively under road crossings on his road, but not under main tracks. He reported that double 48 in. and single 60 in. corrugated iron culverts installed under a yard built in 1912 are still in good service.

The manner of holding cast iron or concrete pipe in place under sliding embankments was also discussed at length. J. B. Clark (B. & O.) reported an experience with several pipes which opened up under an embankment about five years ago, and which were restored to position by clamping with  $1\frac{1}{4}$  in. rods, all of which have since broken. Other members reported difficulty in holding pipes together under similar conditions. The construction of head walls was opposed by several as being more of a menace than a benefit. Chairman Scowden summarized the experiences of a number of roads by stating that head walls properly constructed will aid, but where the banks are sliding these walls must be of heavy design and founded on rock, which precautions are seldom adopted. He deprecated the practice of building culverts to standard designs and stated that, to secure the best results, each culvert should be designed for the particular conditions which it must meet. P. N. Nelson (S. P.) has found that the placing of a concrete blanket reinforced with rails under culverts will overcome the difficulty of their opening up at the joints.

## The Repair and Renewal of Ballast Deck Trestles

[The program of the convention included a report by a committee on the Repair and Renewal of Ballast Deck Trestles, which is abstracted below.]

When first used on trestles, ballast decks were only about 12 ft. wide and were built with solid stringers; later the width was increased to 14 ft., this being generally done by spiking 3-in. plank 14 ft. long on top of the stringers, allowing the planks to extend 12 in. over the edges of the outside stringers at each side to obtain the additional width. The stringers vary in thickness from 6 in. to 9 in. and the depth from 12 in. to 20 in., depending on the length of span and the kind of traffic handled. In this report the width has been assumed as 15 ft. and the distance from center to center of bents as 15 ft. also.

The spacing of the stringers has helped in making inspections of this type of trestle. It also effects a great saving when making repairs, as it is often found that by reinforcing the existing stringers a few more years of service can be secured before they have to be renewed entirely. Wherever possible, the stringers should be

spaced not less than 7 or 8 in. apart. This will permit the use of 6 in. or 7 in. reinforcing timber between the stringers and will add greatly to the strength of any failing stringer, while saving the expense of tearing up the deck and placing a new stringer in the place of an old or failing one.

There is considerable variation in the construction of bulkheads and bents on different railroads, some using fir or cedar piles, while others use treated piles, and still others use stone or concrete in both bulkheads and bents. Where one or more piles must be renewed it is necessary to remove the deck planking to move one or more of the stringers to allow the pile to be driven in its proper place in the bent. A large amount of time can be saved if piles of small dimensions are selected for this repair work. They can be spaced in the bent where the ends of the stringers are joined on the caps by lifting the deck plank on one panel, jacking or wedging the end of the stringer over against the next one, and thus enable the new pile to be lowered between the stringers without removing any stringer entirely. If the bents are of



The Party Visited the Mills of the C. R. McCormick Co., St. Helens, Ore., and the Burlington Concrete Plant at Havelock, Neb.

sufficient height to allow the piles to be driven alongside the caps and then pulled under after being cut, it will eliminate the necessity of removing and replacing the caps. This can be done if the bents are over 10 ft. high. Of course, when the stringer deck is solid it will be necessary to remove enough stringers to allow the new pile to be placed between. If the bents are too low to permit the piles to be pulled under the caps it will be necessary to remove the caps in order to get the piles in proper position. If traffic is very heavy it is often necessary to cut out a portion of the cap, then drive the new pile and put on a new cap. When caps are to be renewed over waterways or streets it is often necessary to spike or bolt a timber to the pile bents, low enough to allow the setting of jacks under the stringers, so that they can be raised sufficiently to allow the cutting of the drift bolts with a hack saw or chisel, the removal of the old caps and the insertion of the new ones. If the time between trains is rather short it is quicker to cut the old cap in short lengths and split it out with bars.

The best way to fasten new caps or piles must be decided on the ground in each instance. In some cases this can be done by simply spiking them well to the piles and stringers, but in most cases it is advisable to use drift bolts again, even if it becomes necessary to remove the ballast over the cap and one of the deck planks. In solid deck stringer trestles it is necessary to use extra long drift bolts to reach through the stringers and caps into the piles.

When it is necessary to renew or reinforce one or more of the stringers it will not be much of a job to insert an additional timber between the stringers if the extra stringer is cut to reach the centers of one panel only, and the top edge of the end that goes up first is beveled. When several stringers are to be renewed in one panel it is advisable to remove the deck planks, replacing them after the new stringers are in place. If the deck planking is to be renewed this simply requires the removal of the ballast, the renewing of the planking where necessary and replacing the ballast again.

The experience of practically everyone who has had to do with repairs of this nature demonstrates that the structures are generally in much worse condition than the bridge inspector's report indicates. This no doubt is explained by the difficulty of making a close and thorough inspection unless a bridge gang is in the vicinity while the inspector is making his inspection, on whom he can call for assistance in digging out, so that he can make a close inspection. Great care must be exercised by bridge gangs in opening up this class of trestle for repairs, because, if allowed to go at it "rough shod," they

may damage much good timber in a short time. Many repairs have been called for in untreated timber trestles covered with roofing paper on account of the damage done by section men when removing the surfacing timbers or blocking under the track ties.

#### Renewing Ballast Deck Trestles

When it is necessary to renew ballast deck trestles from the ground up the material may well be ordered from the office, but when a new deck is to be placed on old bents it is not safe to do this. In such case it is often found that the length of the stringers will vary as much as five inches center to center of caps from one end of the trestle to the other, and it is preferable for the officer directly responsible to take these measurements on the ground. He can there decide as to the length best suited and frequently vary the measurements enough to make the stringers the same length all through the panel, although occasionally he will find a difference of 5 in. or more, and he then has to decide on the lengths to order, as in such cases no two stringers in the panel are the same length. It is advisable to make a pencil sketch of the trestle, showing all the bents and stringers and the lengths of stringers ordered for each panel. If this sketch is turned over to the foreman who is to do the work he will have no difficulty in selecting the correct length of stringer for each panel. When new caps are to be installed they can be shifted a little to one side in order to help out the variation in the length of spans. This will also have to be decided at the time measurements are being taken for the lengths of stringers. On double trestles a variation of 10 in. has been found in the lengths of 30-ft. panels, in which case there are 11 different lengths of stringers in one panel.

After the requisitions have been placed the material should all come forward at one time, so that it can be handled by a work train and unloaded on the ground at the place where it is to be used. If it is a short trestle or is located near a siding or yard the cars may be placed for unloading by a local freight train. Whenever possible the different lengths should be piled together. If the trestle is an extra long one material should be ordered in sections and come forward complete for each section.

After all of the material is on the ground ready to start work the first thing to do is to get the old ballast out of the way. As a rule it is cheaper to waste the ballast over and under the trestle than to try to save it and use it over again. Over streets or tracks it may be necessary to load it and haul it away. On short trestles when the ballast is clean it may be economical to haul



Representatives of the Pennsylvania and the Boston & Maine at the Convention

it to the ends and use it again when the renewal is completed, but it should be done only when the ballast is clean. As the ballast is removed it is necessary to keep the track up near its surface and safe for trains. This is usually done by placing enough of the outer stringers that are being removed under the track ties and between the ties and the old deck plank. Where the old ties are uneven it will be necessary to shim enough of them to keep the track safe for the passage of trains. After all of the ballast has been removed the old deck plank can be lifted and drift bolts removed from the old stringers. This is generally accomplished by the use of a home-made puller.

If new pile bents are to be driven throughout the structure they should be located so as to clear all of the old bents as much as possible in order that the new bents can be cut off, capped and braced before they are called on to carry much, if any, of the weight of the traffic. This cannot always be done, as in cases where permanent abutments are already in place. Here the new bents must be placed in practically the same location as the

old ones, and it will be necessary to follow the method used in replacing piles described in the first part of this report.

In renewing stringers a locomotive crane is very handy, but as all roads are not equipped with this tool the work frequently has to be done by hand. As soon as enough new stringers are in place and bolted it is advisable to start some men placing and spiking the new deck plank, as this helps to stiffen the new deck considerably. The guard timbers should then be placed, after which the trestle is ready for the new ballast. In placing the ballast only enough should be dumped to permit the removal of the temporary blocking under the track ties, after which the balance can be dumped.

[The report was signed by P. N. Nelson (S. P.), chairman; J. W. Wood (A. T. & S. F.), vice-chairman; V. E. Engman (C. M. & St. P.), A. H. King (O. S. L.), F. E. Taggart (I. C.), E. H. Brown (N. P.), Morris Fisher (S. P.), R. B. Robinson (U. P.), J. L. Winter (S. A. L.) and D. F. Holtman (Nat. Lbr. Mfrs. Assoc.).]

[This report was received without discussion.]

## The Practicability of a Uniform Painting Program

[The program of the convention included a thorough discussion of the practicability of a uniform painting program throughout the entire year. This was presented from two angles, a paper by Tom R. Wyles, and a report by one of the standing committees. Both paper and report are abstracted below.]

### Limit Outside Painting to Favorable Season

BY TOM R. WYLES

Vice-President, Detroit Graphite Co., Chicago

Three billion dollars is a conservative estimate of the railway investment in bridges and buildings. The painting program has for its purpose the preservation and maintenance of one and one-half billion to two billion dollars of buildings and structures. Such a responsibility calls for the best planning in its execution, regardless of the disturbance of common practice or precedent.

It is only natural for every man in charge of work to feel that a well-organized gang whose members not only know one another, but also know their railroad, their materials and their job, can produce better results with less lost motion than the haphazard fill-in gang of season-

able work. On most railroads of this country and Canada the months of November, December, January, February, March and, with many, April, are very unsatisfactory for outside operations.

The problem of painting on the railroads in the southern states is, of course, not such a seasonable one as in the North, but painting there in the hot summer months is as much to be avoided as for a northern railroad to paint in the very cold months. Recent tests have shown that, where painting in the southern tier of states in mid-summer where the daily average of temperature ranges from 100 to 115 deg. and the temperature of the steel reaches 150 deg., a paint coating applied to such hot surfaces thins out so that its protective qualities are greatly reduced, and a road does not secure the value of the material or labor. Furthermore, no man can work well from day to day in such temperatures, exposed to the sun, particularly when working on steel that is such a reflector of heat.

Paint is not an economical investment when applied in temperatures below freezing. Many painters make the statement that they can paint below that, but they sacrifice much in durability of the material and investment in labor. No painter who has to guarantee a job would think of applying his paint in low temperatures,



Logging Operations in Oregon—Some New Haven Men—Big Baldwin Trestle on the Southern Pacific

for he knows too well that he is sacrificing a great deal of durability in doing it.

If it were possible to organize standard painting crews on divisions, this would effect a great saving in the cost of work. The size of these crews could be established by the amount of indoor work that can be done during the closed winter months. There is a great deal of such work and much could be added that is now contracted.

Progress can be made in the establishment of a well-organized painting department and crews if the painting work is carefully planned as regards seasons. It will be a great surprise to the average engineer to find the amount of work that can be done with these crews during the winter—such as the painting of signs, and the interiors of stations, freight houses, roundhouses, shops and offices.

I desire to quote from a statement made by Harry F. Jones, master painter of the Cleveland, Cincinnati, Chicago & St. Louis, Wabash, Ind., at the 1919 convention of the Maintenance of Way Master Painters' Association:

"It is impossible to keep practical men by working them six months of the year and laying them off the other six. Under this system we are merely operating a trade school. The men we get are inexperienced. We spend our time during the summer trying to teach them, but some other industry gets the benefit, for when we lay them off in the fall, we seldom get them back in the spring. When the time comes to put on men, we open up our trade school again and pay another gang of inexperienced men good wages to teach them the trade.

"The problem of arranging the works so as to keep them employed throughout the year would be a very small job for the master painter if he were allowed to do so. My system of handling the work is as follows: We do our road work as early in the spring as possible, using motor cars and men enough to finish it in as short a time as possible. Consequently we do not drag it along into the middle of the summer, using valuable time and weather that should be used to better advantage on other work. After completing the road work, we give the steel work the attention it should have, for I think steel structures should be taken care of during the warm months of the year. My experience has been that we get better results—a better job of cleaning and longer life of the paint.

"After completing the steel, we start the station work, doing the exterior work first, leaving interior work wherever possible for the winter months, especially all offices, interiors of shops, etc. During October, we take care of all the glass, requirements, replacing all broken glass and reglazing all sash that requires it.

"The first of the year, I make a schedule of the work to be done that year, showing the amount of labor and material that will be required for the work we have listed. We have been using this system for several years, and I find it much better than the old way. We get a better class of work at less cost by keeping men employed throughout the year."

The most economical man to have on the pay roll is not going to be satisfied with the more or less temporary employment and with the living quarters and equipment which are commonly found on most railroads. It cannot be expected that a good man making good wages will be contented to live in quarters such as are fur-

nished in the so-called "bunk cars" at the present time. Is there any reason why you should not have properly equipped living quarters for these crews, where they can travel more comfortably, be satisfied and do correspondingly better work?

The methods by which materials are handled in most cases are not only inconvenient, but extravagant. Special painting cars should be constructed as necessary equipment to handle paint well and economically. Such cars should carry tankage for linseed oil, turpentine and driers, and should be properly equipped to take care of brushes. Some method should be devised for the moving of scaffolding and ladders and they should be handled in the most economical way. There is also room for improvement in the type of scaffolding ordinarily used.

Paint gangs are often equipped with a motor car, though no facilities are provided for loading it. Each crew should be provided with a flat car for carrying the motor car during long moves, together with scaffolding, ladders and other equipment.

There has been a tendency in the past to disregard the requisitions or requirements of painting gangs. The paint foreman may make out a requisition for certain types of brushes, ladders, scaffolding, steel brushes, etc., but when he begins to draw on his materials on the job he finds them to be widely different from his original requisition. I have personally known paint foremen to take the brushes that have been issued to them to a local hardware store and sell them and then buy the proper kind of brushes with their own money in order to do good work.

The matter of paint packages is vital. We all like to purchase paint in barrels because we save a few cents per gallon in initial cost. However, several railroads have discovered that they can save thousands of dollars a year by buying all of their paints in five-gallon metal packages. It is not only easier for the stores department to handle them, but these packages are also easier for the painter to handle. They also eliminate an enormous waste. I have known of many small maintenance jobs for which a barrel of paint has been ordered from the stores department, when 20 gal. would have done the job. Paint costs only 15 cents to 20 cents a gallon more in five-gallon packages, and in this type of work where the paint is transported from job to job and carried on a car, this small additional cost per gallon will pay for itself and more.

The keeping of proper records by the foreman of the gang is equally important. These records should include a report on the condition of the property as he found it, the amount of material and labor used, and the general condition of the job as finished. This will have a



Two Alabama & Vicksburg Men—On the Salt Lake Trestle—Three Members from the New York Central

tendency to improve the character and speed of his work remarkably.

The importance of a railroad's relations with the public is probably appreciated more by railroad managements today than ever before. The upkeep of stations, ticket offices, waiting rooms, baggage rooms, toilet rooms, etc., is an important phase of a railroad's service to the people and exerts a strong influence on public opinion which is just as essential to the profitable management of a railroad as it is for any other industry. Every community has its own individual pride. Good-looking stations or railroad buildings in the next town have no interest for the town you are in. They want their pride in their own town recognized by the railroad by keeping its property in an attractive condition.

It would be considered a crime if the insurance department of a railroad allowed the insurance on a structure to lapse for one day. However, the painting of buildings and steel structures, performed primarily to preserve the railroad's property, is postponed by neglect and budget cutting without anybody being seriously alarmed by its omission. The replacement of structures is so expensive today that painting is becoming far more important than ever before. This replacement may be postponed by proper protection. The cost of paint is small in comparison with that for insurance.

### Committee Favors All Year Program

The general understanding has always prevailed that railroad buildings, bridges and other structures should be painted only during the summer months and it has, therefore, become an established practice to organize painting crews in the spring and disband them in the fall. Thus each year the railroads face the problem of finding new painters and in most cases must take on new and inexperienced men and train them. In a measure the roads become the training school for the local contractors and lose much in economy and quality of its work.

Outdoor painting can only be done when weather conditions are favorable, but such work as can be protected from the weather or is indoors may be done at any time. Thus we see a wide range of conditions on various railroads, depending upon the location, and varying from the south, where outdoor work can be done at any season, to the north, where the outdoor season is practically confined to a few months.

It is well to consider various phases of the painters' work and the conditions under which it must be done. The proper time for painting steel bridges is, for the most part, limited to the months of June to September, inclusive, although the further south one goes the longer

this period is extended. The painting of other steel structures, such as tanks, turntables and signal bridges, is also limited to about the same period. The season for painting wooden buildings and structures is somewhat longer, as the work may be done both earlier and later in the year. The outdoor season is longer on roads located further south. The remainder of the year may well be named the indoor season, and during that period any class of interior painting or the painting of objects that may be brought under shelter may be done.

In this connection, it may be well to note the practice on the Grand Trunk, as reported by George A. Mitchell, superintendent of bridges and buildings:

"The practice which has been in force on somewhat over 2,000 miles for a number of years has enabled me to maintain a regular force of painters during the entire year. During June, July, August and September our painters are wholly employed in painting steel bridges. During April, May, October and November, and in some seasons the forepart of December, they are employed in the exterior painting of buildings. The balance of the time they are employed in painting and decorating the interiors of our buildings. Therefore, the work is so distributed in this northern country that we are able to employ our painters the entire year and consequently we have men in our service for many years who become accustomed to and skilled in our particular work. Where it is at all practicable to regulate the work under this system we feel that better results will be obtained than by having to employ new men from year to year."

It is possible that the value of painting has not been considered seriously enough and this seems to be borne out by the fact that when financial conditions make it necessary to reduce maintenance expenses the painting program is the first to be curtailed. Steel structures, if neglected and allowed to rust, deteriorate very rapidly and in a few years expensive repairs and renewals are required. Wooden buildings do not deteriorate as rapidly as steel structures, but have usually been given more consideration because of the appearance of the station grounds. The work of the painter is an important factor in the preservation of railroad structures, and the efficiency of the paint crew should be planned for more effectively.

The investigation has also developed another feature that is worthy of serious consideration. Painters are good mechanics and are capable of doing other work in connection with their own. It has been suggested that some additions might be made to the duties of the painting crews which would enable them to do other work when painting around a station and which they could do more economically than other crews sent there especially for that purpose. There is no doubt but that such a policy would bring about a noticeable improvement in the appearance of railroad property in a few years and it would also be evident that the structures would be in

better physical condition because of this attention. For instance, when a painting crew is working at a station the men could replace broken glass as well as take down stove pipes in the spring, clean and paint them and store them for use in the fall. They could clean out gutters and conductor pipes and paint them before they begin to rust. In the fall they could take out window screens, clean and paint them, and put them away, ready for use in the spring. It is a well-known fact that window screens rust more rapidly when stored during the winter than they do while in use during the summer. If such a policy were instituted, the bridge and building supervisor would soon find many things that a painting crew could do while going over the road that would save sending other men to follow them up, and in the end would bring about a marked saving in labor cost to the railway.

The committee feels that it is entirely practicable to perfect a uniform painting program for the entire year which will bring about more efficient and economical painting work and will enable the railway to keep the best men in its employ. If men can be assured of steady employment for the entire year, it is not likely that they will be induced to leave for temporary work at a slightly higher rate of pay. The morale of the crew will be greatly improved because the men, feeling themselves a part of a permanent organization, will take a greater interest and will give a greater return to the railway in both quantity and quality of work done, than is the case under present conditions.

[The report was signed by H. J. Barkley (I. C.), chairman; J. B. Gaut (G. T.), vice-chairman; Eldridge E. Candee (N. Y. N. H. & H.), J. B. Clarke (B. & O.), J. S. Ekey (B. & L. E.), J. A. Hanson (C. C. C. & St. L.), W. C. Harman (S. P.), G. A. Mitchell (G. T.), W. A. Pettis (N. Y. C.), and L. K. Sorenson (C. M. & St. P.).]

#### Discussion

The discussion of this subject centered largely around the extent to which it is practicable to employ painting crews throughout the entire year. J. J. Taylor (K. C. S.) advocated the maintenance of uniform forces throughout the year. With this practice he has found no trouble in securing a sufficient number of men for his painting gangs. It is his practice to employ these forces on his Northern division in the summer and on the Southern division in the winter. One gang does practically all of the metal painting, while several gangs are employed to repair and paint the buildings at the same time. All painting work is done according to a program determined on the basis of information secured on the annual inspection. A. B. Scowden (B. & O.) stated that it is the practice of his road to operate on the basis of an eight-month painting season, laying off all men other than the foreman for four months each year, as it had been considered impossible to do any work during the winter. This year he kept a record of the amount of interior painting done by contract during the summer and found that it was sufficient to have kept 40 per cent of the forces busy throughout the winter.

## Heating Small Passenger Stations

[The following is an abstract of a committee report presented at the Bridge and Building convention.]

The stove is the most economical means of heating small stations without basements where heat is necessary only in the waiting room and office. If the stove is located in the waiting room, it can be provided with a coil connected with a radiator in the office and a comfortable heat will thus be obtained, particularly if the office is not too large. In stations of this type the toilet facilities are usually of the "dry vault" variety, but if not, chemical closets may be installed. If the station is provided with water, short hopper closets may be installed and holes with gratings cut in the partitions, through which enough heat will penetrate to prevent their freezing.

Stoves are, of course, dirty and are often located long distances from the chimney, necessitating elbows and lengthy stovepipes which harbor soot (particularly if bituminous coal is used) from which fires are liable to catch. Every heating unit should be inspected and overhauled at least once each year, the stove, stovepipe and chimney given a thorough cleaning and the broken parts renewed. If this work is done well and regularly the stove will prove serviceable and economical. The maintenance of the stove amounts to very little unless the agent is careless and allows ashes to accumulate and burn out the grates. Many railroads use stoves of one or two sizes of some standard pattern. If this practice is followed the buying and storing of repair parts will be greatly simplified and reduced to a minimum.

In frame stations without basements, where there is water service and several rooms are to be heated, and where more than one stove would be necessary, a hot water heater will be found more serviceable. Such a heater may be installed in the baggage room or in one corner of the waiting room. At points where agents or others are in attendance for about 16 hours each day to

look after the fire, excellent and economical results will be obtained. Where these heaters are left without attention for long periods the water is liable to freeze, either in the radiators or in the expansion tank pipe, and cause much trouble. A considerable amount of this trouble may be averted by the installation of a safety valve on the heater which, in case the expansion tank pipe freezes, will function when the fire is revived. This simple expedient was resorted to after a number of hot water systems had been totally destroyed and has been found to work well. The heaters should be placed on concrete foundations or raised five or six inches above the floor and placed on rails or other non-inflammable material. When given the proper amount of attention the hot water heater is economical in both operation and maintenance.

In small frame stations of good construction or in stations of more permanent character, such as those built of brick or stone, where foundations are necessary, a basement should be provided. The heating system may be hot water, steam or hot air, as dictated by local conditions and individual experience, and should be placed in the basement. Each system has its good and bad points. A larger amount of radiation will have to be provided in a hot water system than in a steam system, and although the hot water heater itself may cost less than a steam boiler, the larger radiators and extra piping will make the first cost of the hot water system greater. As the hot water heater is not designed to carry pressure, it does not have to undergo annual or semi-annual tests, as is the case with a steam boiler. With the hot water system heat is obtained as soon as the water begins to circulate and during the early fall and late spring months a comfortable atmosphere may be obtained at a small cost, whereas with the steam system a good fire will have to be made and maintained to obtain the de-

sired amount of heat, and quite often more heat than is necessary will result. This is costly. In cold climates or where long periods of cold weather are the rule the hot water system will often be found inadequate and the steam boiler will give more satisfactory results. Hot air furnaces, including the one-pipe variety, have been found most satisfactory in certain locations. They are most economical, but are objectionable because they create a dry, musty atmosphere which is considered unhealthy by many. This may be counteracted somewhat by placing pans of water around the station. The hot water heating system is the most expensive to maintain for reasons set forth in the preceding paragraph, whereas the steam heater, which does not afford the same chance for freezing, will be more economical. The maintenance of the hot air furnace will be practically no greater than that for the stove.

Anthracite coal is the most desirable fuel. Its cost is, however, against it, and many roads are therefore using bituminous coal. Where the latter is used maintenance costs are higher and greater care must be given to the heating system by all concerned. Larger smoke pipes and flues should be provided and frequent cleaning of the heater, pipe and chimney is necessary. If this attention is given, better results will be obtained and fire hazards reduced. If wood is burned, hard pine should be avoided, as a pitchy residue is deposited on the inside of the heater and in the smoke pipes which is highly inflammable. There do not seem to be many installations using fuel oil, but the committee is of the opinion that the use of oil for heating purposes should be encouraged.

In practically all small stations heaters are looked

after by agents and their assistants who do the work as part of their duties. Too often their only consideration is to get the required amount of heat, regardless of the amount of fuel used and damage to the unit. Agents must either be educated to care for the heating arrangements as they would their own, or hard and fast rules must be made and lived up to. The human element is largely responsible for the manner in which a heating unit functions and the best designed heating system can be made both unsatisfactory and costly by lack of proper attention. All heating systems should have regular inspection with a view to having them thoroughly cleaned, all broken and worn out parts renewed, all pipes covered and everything put in good condition for the cold season. If this work is done conscientiously, maintenance costs will be reduced to the minimum and much trouble will be obviated.

[The report was signed by A. I. Gauthier (B. & M.), chairman; T. B. Turnbull (A. A.), vice-chairman; R. T. Everett (B. & O.) and C. J. Scribner (C. B. & Q.).]

### Discussion

T. B. Turnbull (Ann Arbor) emphasized the importance of maintaining the foundations and buildings in proper condition to prevent heat losses. He also emphasized the importance of a proper design of stove to conserve fuel, stating that most of the designs in common use were not as economical in this respect as was possible. C. R. Knowles (I. C.) referred to several stations near pumping houses where advantage was taken of the exhaust steam from the pumping plants to heat the stations, thereby paying a portion of the cost of pumping.

## Installing or Replacing Culverts and Pipe Lines

[A discussion of methods to be pursued in installing or replacing culverts and pipe lines under traffic was presented as a committee report, which appears in abstract below.]

No work required of bridge and building forces calls for greater ingenuity and resourcefulness than the installation or replacement of culverts, sewers and pipe lines under traffic. Installations must be made with a minimum of interference with traffic and often without restricting high speed train movements.

When quicksand, soft muck or other unstable soil is encountered, and tunneling is impracticable, it is necessary to drive piling and construct a temporary opening the length of which is determined by the size of the pipe or culvert and its depth below grade. If the bents next to the pipe are driven far enough apart to allow for working room on each side, they support the side of the trench. If necessary, sheeting may be placed behind the bents. On account of the increased cost, especially if a work train is required to handle the driver, the driving of piles should be done only when absolutely necessary.

If the pipe is small and the open trench method is used it is advisable to transfer the track support some distance each side of the trench. One method is to place a section of second-hand bridge stringers about 6 ft. long flatwise under the track ties, under each rail. The trench should also be cross-braced with trench jacks. The Pennsylvania accomplishes the same result by placing a track rail under the ends of the track ties, with the ball up, and immediately over it another rail on top of the ties, fastening the two rails with clamps made for the purpose. This provides a strong support at a minimum expense, as extra rails are usually available on each section. The Illinois

Central uses a rail hanger to support the traffic rail over trenches, carrying a rail on each side of the traffic rail with hangers that pass under the traffic rail and over the extra rails where the ties are not supported on account of the trench excavation.

If the pipe is large or if two or more pipes are placed side by side, one method generally approved is to dig a narrow trench under the track at each end of the section to be excavated, set up frame bents, and support the track on stringers placed under the track ties. This is a good method to use when it is necessary to remove broken pipe or old stone or timber culverts.

It is often necessary to replace an old stone box or timber culvert under an embankment that is so high that it is not practical to use the open trench method. If the inside dimension of a timber culvert is not more than ten inches less than the outside dimension of the pipe, the bottom and sides can be adzed out to allow the pipe to be pulled into place by the use of a hand winch. A greased plank with a shovel blade under the end of the pipe will make the work easier. Some prefer two skids made of 2-in. by 4-in. timber placed 8 in. apart and spiked to the bottom timbers of the culvert. When it is necessary to remove the old culvert entirely, the open trench method can be used for the ends and the tunnel method for the portion under the tracks.

One method of timbering a tunnel is to excavate carefully to the proper dimension and insert timber or plank sets as fast as the excavation proceeds, placing the mud sill and top first and, while holding the top in place with a jack, place the side pieces, after which a strip should be spiked to the top piece to keep the sides from crowding in. Another method is to excavate a tunnel 3 or 4 ft.

wide, set up frame bents and drive lagging over the top of the bents, as the excavation is made, setting additional bents as the work proceeds. As only a small force can be employed in a tunnel it is advisable to work from both ends. Tunnel work can be handled best during the winter season. Where new work is being put in (such as sewers and drainage district pipes) stakes should be set outside of the tunnel for line and grade. Where small pipe lines pass under several tracks, it is often advisable to sink shafts between the tracks and tunnel under the track between the shafts. If the ground is firm it is often possible to tunnel between shafts without using any supports if the pipe can be placed at once and the backfilling tamped into place around the pipe. A chain hoist is a valuable aid when lowering pipe down a shaft or into a trench.

[The report was signed by E. L. Sinclair (C. M. & St. P.), chairman; J. J. Wishart (N. Y. N. H. & H.), F. L. Wheaton (D. L. & W.), E. J. Fraser (N. Y. C.), D. L. McKee (P. & L. E.), Robert McKibben (Penna.), and Norman Rose (S. P.).]

### Discussion

E. L. Cochran (Southern) advocated the driving of tunnels under tracks for pipes up to 48 in. under most conditions, finding this cheaper than the driving of piling to support the tracks. J. Gratto (S. P.) advocated the driving of piles to carry tracks in embankments less than 14 ft. high and tunneling embankments over this height.

J. J. Taylor (K. C. S.) reported failures in several instances where he had inserted pipe within timber boxes, as a result of which experience he advocated the removal of the box in its entirety. E. L. Sinclair (C. M. & St. P.) did not think that the inserting of pipes inside of old boxes should be discouraged because of occasional failures, and P. N. Nelson (S. P.) pointed out that it had been his practice to remove the bottom of the box and lay the pipe on the old bed. F. A. Taylor (B. & O.) stated that where this had been done he had encountered no trouble and attributed failures which had been reported to poor foundations.

## The Forest Resources of the Northwest

In view of the purpose which prompted the selection of Seattle as the location for this convention, special attention was given to the study of the forest resources of the Northwest. At a luncheon given by the Tacoma Lumbermen's Club at Tacoma, Wash., on Monday, October 15, C. J. Hogue, engineer, West Coast Forest Products Bureau, New York City, described the physical characteristics of Douglas fir. On Tuesday evening Ernest Dolge, vice-president for Washington of the West Coast Lumbermen's Association, described the timber resources of the Northwest. Following is an abstract of Mr. Hogue's paper and a brief review of Mr. Dolge's address:

### The Structural Properties of Douglas Fir

BY C. J. HOGUE

Manager, West Coast Forest Products Bureau

Bridge and building operations require nearly one thousand million feet of lumber a year. Douglas fir is becoming of increasing importance in bridge construction, particularly where large timbers are required. It is commonly accepted on the Atlantic coast that if a timber larger than 12 in. by 12 in.-40 ft long is required, it must be furnished in Douglas fir, and the Timber committee of the American Railway Engineering Association frankly acknowledges that if a stringer larger than 8 in. by 16 in. is required, it will probably be in Douglas fir, so that when we come to the 8 in. by 18 in., 9 in. by 18 in., 10 in. by 18 in. and 10 in. by 20 in. stringers, they will almost necessarily be from the West coast.

As southern pine, and particularly long leaf southern pine, has been the standard timber for railroad construction for a generation, and as southern pine is more nearly like Douglas fir than any other species, I will describe Douglas fir in terms comparative with this species. The Forest Products Laboratory at Madison, Wis., in testing Douglas fir and the various species of southern pine, has found very little difference in their strength values, and in speaking of southern pine in this connection, I refer to short leaf and loblolly as well as to long leaf, for Douglas fir as a whole should be compared with southern pine as a whole, and when Douglas fir is compared with long leaf pine it should be a particular type of Douglas fir. Many tests have been made on the different species of woods at Madison, but few tests directly comparable,

so a year or two ago in New York we selected some samples of Douglas fir and long leaf pine, intended to cover as nearly as possible the entire range of each species as found in the New York market. The grades were No. 1 common Douglas fir and merchantable long leaf southern pine. Please note this particularly, for No. 1 common fir and merchantable long leaf pine are not equivalent grades, and we would expect the low line pieces of the No. 1 common fir to fall below those of the merchantable long leaf. On the curve it is seen that the lower 25 per cent of the pieces of fir do so, but that three-fourths of the fir pieces line up with the pine pieces value for value, and so completely through the upper half of the range as to almost coincide.

In southern pine grading, two points are of principal importance: (1) The type of wood, whether of long leaf on the one hand, or short leaf or loblolly on the other; and (2) the amount of sapwood permitted, as governed by the grade: Merchantable, square edge and sound, or No. 1 common.

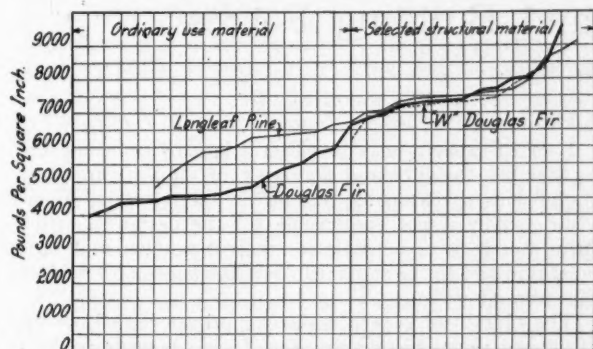
Douglas fir is noticeable for its thin ring of sapwood, not more than 1½ in. or 2 in. wide in a 4 or 5 ft. log. This means that it is comparatively easy to get Douglas fir timbers with a very small amount of sap face. Evidence is accumulating also that the sapwood of Douglas fir is more durable than sapwood usually is. Many stringers have remained in bridges year after year with the sap corners as sound as the heartwood. If the conditions under which this is so can be determined, and sap restrictions waived or limited, it will be a great advantage in obtaining large timbers. Sapwood is not a factor in strength, as it is as strong as heartwood, but is of importance only as concerns decay, for when decay has taken place the strength of the wood is gone.

It is largely the rate of growth of the trees which concerns us in selecting for you material equivalent to merchantable long leaf pine and our problem of segregation is greater than that of the South, where the stands are more or less uniformly of one type or the other. With us, on account of the range in elevation in our logging camps and the variations in orientation due to the growth on side hill stands, we do not find the same uniformity and so have to go to greater pains in segregation.

If the rate of growth is slow enough at the center of a log, whether red or yellow, a timber may box the heart, that is, contain the pith, while if the rate of growth

is too rapid at the very center of the log, we may have to go a few inches away to cut structural timber. The boxed heart timber has some advantages over the side cut one, and the side cut timber some advantages over the boxed heart. It depends on the log, which is the best to cut.

In the large, old-growth timber, the rate of growth is coarse at the center and gradually becomes finer and finer toward the outside of the tree. The strength of the wood, on the other hand, increases from the center of the tree rather rapidly at first to a maximum at 12 to 15 in. from the center, and then gradually begins to decrease so that the strongest wood is usually found 10 to 15 in. from the center of the tree. Therefore, we do not



Comparative Strengths of Yellow Pine and Douglas Fir—Each Vertical Line Represents an Individual Test

want to specify either red fir or yellow fir, because, on the one hand, the coarse grained red fir tends toward light weight and low strength, while, on the other hand, the very fine grained yellow fir does the same. What we do want is a normal or medium rate of growth, found in the merging of the two colors.

The strength of wood is largely proportional to its dry weight or the amount of wood substance present, that is, the amount of wood substance as compared with the porosity of air spaces within the wood cells. In trying to find a visual means of determining strength, we have endeavored for some time to apply a density rule, measured by the amount of summer wood or hard, dark wood of the annual ring. This method refuses to work out practically, however, and, fortunately, it does not seem to be essential. We find, for instance, that 75 to 80 per cent of the average run of No. 1 common Douglas fir is of medium or normal rate of growth and, again, that 75 to 80 per cent of the Douglas fir of medium rate of growth would pass a density rule, and if cut from the structural type of log or structural type material in a large log, none of the wood of medium rate of growth would fall so much below the density requirement of one-third summer wood as to make it necessary to use a lower stress in a timber of which this wood was a part, so that segregation of type of material under a rate of growth rule will go practically as far as necessary in providing material of satisfactory uniformity.

We are now trying to develop standard structural grades to bring out all these points. I believe that two grades are all that are required to furnish satisfactory structural material: A standard stringer grade and a second grade, the first to be equivalent to selected common Douglas fir or merchantable long leaf southern pine, the other to take in the actual No. 1 common Douglas fir and No. 1 common long leaf or short leaf pine.

In the standard stringer grade the first requirement would be medium rate of growth. Given material of the structural type in both Douglas fir and southern pine,

the size of defects is more important than an actual determination of density. Density will, of course, be given a premium, so that a piece otherwise meeting the requirements of a grade and also meeting the requirements of the density rule will be given an additional value of several hundred pounds per square inch.

Next to type of material, knots are of the greatest importance, and the effect of knots must be considered differently on the top or bottom of a stringer than on the side, and differently again in a post or column than in a beam or stringer. On the top or bottom of a beam or stringer, the importance of a knot is in the number of surface fibres cut, for here the tension or compression is the greatest, and the size of the knot must be measured by the portion of the width which it cuts from the face. The shape or size of a knot on the wide face of a stringer, on the other hand, is not of as much importance as the depth and direction of the penetration of the knot into the beam or piece. The effect within a beam of a knot showing on its face is largely of the actual size of the knot and may, therefore, be measured on the wide face of a beam or stringer as the minimum diameter showing on the face. Then, again, the size of a knot toward the top and bottom of a beam, through the center portion, is of greater importance than along the center line or toward the end, and so, toward the center line of the wide face and toward the end, the size of the knot may be allowed to increase. In a post or column the stress is a combination of bending and direct compression and the effect of a knot can be best measured through the mean or average diameter.

The amounts of shake and check are important in a structural grade, as governing to a considerable extent the resistance to shear and limits on these will be found in the structural grades. Angle of grain, or the direction of the fibres with relation to the axis of the tree, is of very great importance. In many trees the fibres will deviate somewhat from the vertical, and twist or take a spiral position around the tree.

Seasoning checks, when they come, follow the direction of these fibres, and if the spiral is materially greater than a slope of 1 in 20, the beam or piece will be materially reduced in strength, both in shear and bending, by the direction of the seasoning checks. A reasonable limit on the angle of the grain must, therefore, be placed.

A limitation on the amount of sapwood must be placed for material to be used in exposed positions, such as bridges, docks, piers, etc., not from the strength standpoint, but from the standpoint of durability. For interior use there need be no limit placed on the amount of sapwood or sap face if the material is to be kept permanently dry.

## Northwest Supplies One-third of Timber

By ERNEST DOLGE

Vice-President, West Coast Lumbermen's Association

Half of the 2,215,000,000,000 ft. of standing timber in the United States is in Washington, Oregon and California. The total production of all timber in the United States in 1922 was 31,000,000,000 ft., of which 9,000,000,000 ft. was produced in Oregon and Washington. With the decline in production in other territories, it is evident that the railways and other timber-consuming industries must look to the Northwest for their requirements to an increasing extent in the future. The lumberman is required to take the tree as he finds it. The roads, on the other hand, must insist on timber of sufficient strength to meet their needs. Mr. Dolge urged mutual consideration of the problem meeting these requirements. He described the work now under way to promote standardi-

zation of sizes, grades and nomenclature. He also outlined the progress that is being made in the control of forest fires in reforestation.

Following the conclusion of this address, an active discussion resulted, during which numerous members raised questions regarding the difficulties which they had encountered in the use of Douglas fir and other western timbers. In response to an inquiry regarding a common impression that timber renders its best service under conditions similar to those in which it is grown, it was stated that investigations made by the United States Forest Products Laboratory, Madison, Wis., indicated that the durability of timber was not affected by varia-

tions in the altitude of the point of use. In view of the resistance of timber to penetration by creosote, the question was raised regarding similar resistance to paint, in reply to which it was pointed out that paint is a surface coating which does not require deep penetration and that the service of large numbers of freight cars of Douglas fir in all parts of the country indicated no difficulty in this respect. Another question which aroused considerable discussion was with regard to the reasons for the increased cost of longer timbers, in reply to which it was pointed out that when timbers longer than those for which the mills are designed are required, operation of the mill is slowed down and the output reduced.

## Supervision of Bridge and Building Forces

By GEORGE W. REAR

Engineer of Bridges, Southern Pacific, Pacific System, San Francisco, Cal.

[The program of the convention included a paper presented by George W. Rear on the organization required for the conduct and supervision of bridge and building forces. Mr. Rear's paper is abstracted below.]

Bridge and building forces perform practically all work in connection with the maintenance and reconstruction of bridges, buildings and other roadway structures and appliances and all other mechanical work that is not definitely allotted to some other department. They are responsible for the expenditure of about one-quarter of all maintenance of way expense or about two hundred millions per year. The supervision of this large expenditure, in the face of interference with operation, is a serious problem and affords plenty of opportunity for the exercise of ability on the part of the supervisors.

Most rule books designate the supervisor's duties as follows:

"Supervisors of bridges and buildings report to a superior and under him are responsible for the inspection and safe maintenance of all structures, etc."

This rule contains the secret for the successful supervisor; it can be said without fear of contradiction that every supervisor who has been made responsible and who assumed the complete responsibility, has been successful, the failures being only those who were denied full responsibility or who were not able to assume it. The supervisor has many duties and responsibilities and at the outset we may assume that he will be short of help and will have to exercise the greatest economy to perform the work with the money that may be available.

The supervisor should become so familiar with all the structures on his territory as to know all their peculiarities without reference to records. Bridges and culverts are seldom perfect, stations are inadequate and water and fuel supplies are heavily taxed, especially during the periods of heavy traffic. Bridges and culverts may not be able to take care of freshets and floods properly, drift may be troublesome or the traffic over them may be so heavy as to make almost continuous repairs necessary. All of these peculiarities should be well known to the supervisor so proper measures can be taken to protect them in case of necessity.

The supervisor should be responsible for the regular inspection of structures and should inspect them in person at least once each year. Even on large and busy divisions nothing excuses him for a failure to see his structures every year. The work of inspection requires experience and sound judgment, especially for those structures that are approaching the time for replacement, due either to physical condition or lack of capacity.

Lack of capacity may be either a lack of sufficient size or stability to withstand floods or of capacity to carry traffic with a reasonable margin of safety. The supervisor usually is not responsible for the design of structures, but he is responsible for their maintenance in safe condition and to the standard of maintenance observed on his railroad.

The supervisor is responsible for proper records of the structures under his charge even if such records are kept in other offices. He should have the most exact and complete information as to matters of foundation, location of pipe lines, flood damage, etc., as he is the first to be called on for such information when it is required. It is probable that this feature is quite generally neglected, owing to pressure of other work and lack of sufficient help, but it should not be, as it is a duty he owes to his successor and his railroad.

The supervisor should keep records of the work that will be necessary for some months in advance and on a well-organized division it should never become necessary to make rush or emergency repairs, except, of course, as the result of a washout or accident. Such a program of work, and its authorization in ample time, enables the supervisor to plan his work and avoid moving gangs back and forth over the same territory. This is especially true where the gangs cover a large mileage, as is the case on western railroads. In spite of the best plans much time is lost by gangs in traveling from place to place, but efforts should be made to reduce it to a minimum.

### Organization

The supervisor should have sufficient organization to take care of the work on his territory, but he can expect to be shorthanded and will find it necessary to get the utmost service out of each employee if he is to keep his head above water.

Having neither men nor money enough to take care of his work is not as serious a matter as it appears, for it has a tendency to bring forth hidden resources and results in greater economy. Of course, there is a limit beyond which it is impossible to go without resorting to makeshift and slipshod methods that soon become visible to everyone. Sometimes these makeshift methods are the result of improper supervision and discipline and thus become a balance by which the supervisor is weighed.

Owing to variations in lengths of divisions and the work thereon, it is impossible to outline what forces the supervisor should employ, but whether they are large or small they should have only one boss and he should be the supervisor.

The successful supervisor becomes a very important part of the divisional organization and his resourcefulness and experience are a great satisfaction to his superiors if they can place entire confidence in him, especially in cases of emergency. The successful supervisor works in close contact with the other departments and one of the earmarks of a good man is the willingness of all the other departments to rally to his assistance when required. Close co-operation with the supply department results in much good, as suitable supplies of material for his work may often be found in stock, thus avoiding the purchasing of new material. Supervisors should keep the supply department advised of future requirements as far as possible, especially if out of the ordinary in character, as this may have the effect of getting better delivery when the material is required.

What manner of man is this of whom so much is expected? Much is expected and the results justify the expectation. No set rule can be set down for the cultivation of men for the position of supervisor, as successful

men have sprung from a great variety of conditions, but if we were to consider the qualifications necessary they might be put as follows:

First is character: The supervisor should be an upright, clean-living citizen of his community, respected by his neighbors and associates.

Second: He should be a good business man, as it will be necessary for him to handle many business affairs for his employer.

Third: He should be born with the constructive instinct, as he will be responsible for work performed under all the mechanical trades and it is hardly possible to become familiar with all of them.

Fourth: He should be even tempered, fair-minded without prejudices as to religion, race or politics, so that he can treat his subordinates properly and thus earn their loyalty and respect.

Fifth: He should have a good education, especially in these days of complicated reports, etc. The successful supervisor is never fully educated, but the better education he can bring to the job the easier it will be for him to continue the process of education, which will only be completed at his retirement.

[The paper was accepted without discussion.]

## The Construction and Maintenance of Water Facilities at Stock Yards

[Following is an abstract of a committee report on water service in stock yards.]

The provision of an adequate supply of water at stock yards and the maintenance of this supply under all conditions is as essential to the operation of railroads as the furnishing of cars for transporting live stock.

### Source of Supply

The water is usually taken from existing mains supplying other facilities. At the smaller yards a driven or dug well will furnish an adequate supply. Where water is close to the surface a 1¼-in. pipe with a drive point and a 3-in. by 10-in. cylinder with a hand pump will answer. Where these cannot be used a 2-in. or 3-in. tubular well is used with a windmill or other power for pumping. In some localities the water head is so low that a very deep tubular well is required which cannot be used with a hand pump. A windmill is therefore provided and also a cistern and the water pumped first into the cistern and then pumped from the cistern with a hand pump. These cisterns vary in size from 6 ft. by 8 ft. to 10 ft. by 12 ft. In clay soil they are constructed by coating the walls of the excavation with cement and arching over the top with brick. In lighter soils a brick wall is plastered with cement, or the walls are built entirely of concrete. In all cases the top of the cistern must be sufficiently below the surface of the ground to prevent freezing.

At the smaller yards with from two to four pens a hand pump is generally used with a 3-in. or 4-in. by 10-in. cylinder. It should be of heavy construction because the users do not generally exercise much care in handling it. At larger yards windmills and supply tanks are used. Windmills usually have 10 or 12 ft. wheels, the latter preferred, mounted on wood or steel towers varying from 30 to 50 ft. in height. Wood wheels with direct stroke are preferable to steel wheels with gearing, as they are easier to maintain. Where windmills are used for pumping into storage tanks and conditions are such that tanks can be used in the winter time, hand pump tops are omitted, using instead only the cylinder with a stuffing box, but in climates where storage tanks must be drained in the winter a hand pump top should be installed with the windmill and the pipes to the tank cut off so that water can be supplied to at least one pen during the

winter. Because the need of water at stock yards is intermittent the use of gas or oil engines for pumping is not practicable except at large feeding-in-transit yards, and at these water can usually be secured from city mains or railway pumping plants.

### Storage Tanks

Storage tanks vary in size from 1,000 gal. capacity up, according to the needs of the yards. At the smaller yards, where it is not necessary to protect the water supply from freezing, galvanized iron tanks of 1,000 to 2,000 gal. capacity are preferable, because they can be drained in the fall. Wooden tanks are difficult to maintain under such conditions as they dry out while empty during the winter and it is necessary to tighten the hoops and often to put in extra staves in the spring. The smaller wood and galvanized iron tanks are mounted on frame supports and consist of 8-in. by 8-in. posts, caps and sills and pile head foundations, or concrete pillars with 2-in. by 8-in. braces on posts and are elevated from 12 to 20 ft. above the ground with piping unprotected. As they are not used in the winter time frost boxes are not necessary.

At stock yards where supply tanks are used during the winter they are of larger capacity, ranging from 8 ft. by 10 ft. to 12 ft. by 12 ft., with standard frost boxes with three dead air spaces and roof. Where sufficient water is used this type of tank can be employed during the winter. In some localities storage tanks are constructed with a housing that completely covers the tank. These tanks are carried on concrete foundations and wood supports with pits under the tank to below the frost line to permit the natural warmth from the earth to help prevent freezing. This housing is built of six layers of matched lumber and tarred felt with three air spaces. There is some question whether this construction is frost proof in northern climates. In general, except at the larger yards where considerable water is used, it is impracticable to maintain supply tanks at stock yards in cold climates during the winter, because little water is used and this can easily be supplied with a hand pump where other supply is not available.

Pipe lines should be of a size consistent with the need of the yard, ranging from 1 in. for small yards to 6 in. for large feeding yards. However, 1¼ to 2 in. mains will

be sufficient for the average yard, with branch lines to hydrants of corresponding size. Wherever practicable, water mains should be located outside of the yards.

### Hydrants

One of the most difficult problems in furnishing water to stock yards is the maintenance of the valves or hydrants through which the water from the pipe lines is delivered to the watering troughs. Valves above ground are not satisfactory because it is necessary to protect them from freezing. Pit hydrants are almost universally used. The type most generally employed is the common tee-handle hydrant cock with a key or stem on a handle of sufficient length to reach above the pit, with a loose joint at the top of the riser pipe so that the outlet pipe can be swung to two or more troughs. In many places a hose connection is applied to the elbow at the top of the riser pipe and a short piece of hose is used for delivering water to the troughs. Hydrants at stock yards vary in size from  $\frac{3}{4}$  in. to  $1\frac{1}{4}$  in. However, the 1-in. size will deliver enough water for ordinary use. Where the arrangement of pens will permit, one hydrant will generally serve two pens, although at yards where stock shipments are heavy it is more satisfactory to have one hydrant for each pen. Wherever possible hydrants should be located outside of yards to secure proper drainage. A hydrant should also be located at or near the loading chutes with hose connection for use in wetting down cars for loading hogs and showering them while waiting for trains.

Hydrant pits are constructed of wood, brick or concrete and range in size from  $2\frac{1}{2}$  ft. to 4 ft. square or round and of a depth to suit local conditions. In general, a pit 3 ft. in diameter or square gives sufficient room for all work. Those constructed of wood are easily built and of comparatively low first cost, but they do not last long, as the lumber decays in a few years and must be renewed. The concrete hydrant pit with reinforced top is permanent, but is rather expensive in first cost.

A hydrant pit of brick has been used considerably. It is comparatively low in cost and equals concrete pit in life. It is 3 ft. in diameter and 5 ft. deep with a reinforced concrete slab cover with an 18-in. square hole in the center for the riser pipe and stem. The edges of this manhole are constructed so that a 2-in. plank cover can be used flush with the top. Hydrant pits should be constructed with a false bottom at least 2 ft. below the top and the space above filled with packing to prevent freezing during the winter.

### Watering Troughs

While watering troughs are constructed of galvanized iron, wood and concrete, and are of various lengths and sizes, wood is most commonly used. For stock these are made 16 ft. long with flaring sides 10 in. deep, being 10 in. wide inside at the bottom and 12 in. wide at the top with one  $\frac{3}{8}$ -in. bolt at each end and two struts at the center. While these troughs are of low first cost they are not always satisfactory, because when not used they dry out and leak. Watering troughs for hogs are constructed of 2-in. by 10-in. by 16-ft. and 2-in. by 12-in. by 16-ft. planks spiked together V-shaped with ends and three struts between. These troughs are favored in many places, as freezing does not damage them to any great extent and unless decayed, cracks can easily be repaired with a little thick paint and battens. Metal troughs are from 12 ft. to 16 ft. long and 20 in. wide at the top with half circle bottom.

Concrete watering troughs are used with success by many railroads, even in the colder climates. They are made of reinforced concrete at a central plant at a cost of from \$5.50 to \$15 each. The same type is generally used

for both cattle and hogs. Those for cattle are set on concrete blocks and those for hogs directly on the ground. They are not fastened, for when they are once placed they are heavy enough to stay, as they weigh from 600 to 900 lb. each. The walls and bottoms of these concrete troughs are from 2 in. to 3 in. thick and are reinforced with  $\frac{1}{4}$ -in. rods or No. 4A wire mesh. They are provided with cast holes for drainage and in some cases with overflow pipes to the hydrant pit. They are built both open and with partitions. The latter, although heavier and more expensive to make and put in place, are stronger.

### Showers

Showers should be located at all stock yard chutes for wetting down cars for hogs before loading. They are also provided by many railroads at roadside tanks or water penstocks. For use at stock chutes a 1-in. hydrant with hose connection is suitable. Showers for wetting down hogs in transit are usually located at or near water stations, are constructed of 2-in. or 3-in. pipe and are provided for both double and single-deck cars. A gate valve is used in the main to control the flow of water. For single-deck showers the riser pipe extends about 6 ft. above the rail, where a spray nozzle is attached with elbow and tee with a loose joint and a handle on the side opposite the nozzle. A rope is attached to the end of the handle for convenience in pulling up the nozzle. The nozzle is constructed by flattening out the end of the pipe to leave a  $\frac{3}{8}$ -in. opening. Stock in cars can be wet down thoroughly with this type of shower while moving by.

[The report was signed by Herman Heisenbuttel (C. & N. W.), chairman; A. M. Swensen (M. St. P. & S. S. M.), vice-chairman; F. M. Case (C. & N. W.), E. A. Demars (O. S. L.), H. H. Frazer (S. P.), C. J. McCarthy (C. M. & St. P.), and G. T. Ray (St. J. & G. I.).]

### Closing Business

The report of the secretary-treasurer showed an excess of receipts over expenditures for the year of \$187 and a net gain in members of 20, the total membership of the association now being approximately 900.

The following officers were elected for the ensuing year: President, J. S. Robinson, division engineer, C. & N. W., Chicago; first vice-president, J. P. Wood, supervisor of bridges and buildings, P. M., Saginaw, Mich.; second vice-president, C. W. Wright, master carpenter, Long Island Railroad, Jamaica, N. Y.; third vice-president, E. T. Howson, editor, *Railway Engineering and Maintenance*, Chicago; fourth vice-president, F. C. Baluss, bridge engineer, D. M. & N., Duluth, Minn.; secretary-treasurer, C. A. Lichty, purchasing department, C. & N. W., Chicago, and assistant secretary; F. E. Weise, chief clerk to chief engineer, C. M. & St. P., Chicago. Directors: J. S. Huntoon, assistant bridge engineer, M. C., Detroit, Mich.; A. I. Gauthier, supervisor of bridges and buildings, B. & M., Concord, N. H., and E. L. Sinclair, assistant engineer, C. M. & St. P., Marion, Iowa. Kansas City, Mo., was selected as the place for the next meeting.

The Committee on Subjects suggested the following topics for consideration next year:

- Smokejacks for roundhouses and other railway buildings.
- The fire hazard of treated timbers.
- The maintenance of water stations.
- Handling concrete in winter.

- Relative merits of different kinds of roofing materials for different kinds of buildings.
- Reduction of accidents to bridge and building employees.
- Inspection of painting.
- Economical methods of handling minor bridge and building maintenance work.

# WHAT'S THE ANSWER?



This department is an open forum for the discussion of practical problems of engineering and maintenance of way. Readers are invited to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. *Railway Engineering and Maintenance* also invites the co-operation of its readers in answering any of the questions listed below.

## Questions to Be Answered in the January Issue:

- (1) *Is it advisable to have bent track spikes straightened by the section forces instead of sending them to a reclamation plant?*
- (2) *In developing ground water supplies, should the test holes be made the same size as the proposed wells, and if not, how is the flow obtainable from the proposed wells to be estimated from that obtained from the test well?*
- (3) *What are the advantages, if any, of using pipe coils in preference to cast radiator units for heating railway buildings?*
- (4) *Are portable power saws of practical value to bridge and building gangs?*
- (5) *Should the joint bolts in track be loosened temporarily upon the approach of extreme cold weather to allow for contraction of the rails?*
- (6) *Is there any remedy for trouble from fish in water supply reservoirs aside from screen-covered intakes? Can the water be treated to kill them without rendering it unfit for boiler use?*
- (7) *Is the use of portable telephones by bridge gangs to be recommended?*
- (8) *What are the relative merits of factory ribbed, wire and the several thicknesses and classes of plain glass for railway buildings?*

## Riding Trains to Inspect Track

*Is it advisable to have section foremen ride over their sections on locomotives or trains to determine the riding qualities of track?*

### First Answer

It has been my practice to ride over my section either on the locomotives or the trains once a week to determine the riding conditions of my section and I have found this a very good practice. It would be a very good thing if roadmasters and track supervisors would allow the section foremen to ride the local trains over their sections about two times a month at least, dividing their time so all the foremen do not do so at the same time. It is often found by doing this that places are found out of line with uneven track and low places, etc., which have been overlooked.

THOR MONRAD,

Foreman, Northern Pacific, Ollie, Mont.

### Second Answer

It is advisable for section foremen to ride over their sections on trains in order to note bad spots that cause uneven riding. Usually the foremen know the bad spots but when labor or materials are scarce some of these spots are not repaired, causing rough riding in trains. It is also advisable for the supervisor to make the trip,

then have several foremen cover the same road and report their findings to the supervisor. In this manner an impartial report is obtained and the best course pursued to have the bad spots corrected.

A. BOLOGNESE,

Foreman, Philadelphia & Reading, Royersford, Pa.

### Third Answer

If section foremen were permitted to ride the tail end of a caboose hop, or other fast train twice a month, it would certainly give them an opportunity to find out places that required first attention.

W. R. MAYNE,

Foreman, Canadian Pacific Railway, Thompson Siding, B. C.

### Fourth Answer

My experience is that it is advisable for the foreman to ride over his section at least once a week, and other sections if convenient. He should go one way on the locomotive and back on the rear end of the train, noting carefully the rough track, also the different effects it has on the train. He should note closely what conditions exist in the track or roadbed that cause the rough riding, and repair them while they are fresh on the mind. I find in over 15 years of experience that to apply this method is the best way to get good track maintenance.

All roads should provide card passes to their foremen with the request to use them freely on Sundays to fam-

iliarize themselves with the riding condition of the road. He should note carefully his section along with other sections. Sometimes a man can see things away from home that can be applied with much success on his home section. This will build up a better grade of men and will be a great inducement to the young foreman to push himself forward.

J. M. KING,

Foreman, Texas Interurban, Forney, Texas.

#### Fifth Answer

When possible, I think it is a very good practice to have the foreman ride over his section at regular intervals. It not only permits them to learn the riding qualities of their track but enables him to see the effect of repairs and general surfacing. Seeing the results of their work will have the effect of urging him on to do better work. Often the roadmaster notifies a foreman about a piece of track being out of level or line although the foreman cannot see how it should cause trouble. But after making trips regularly over the section he learns the results of slight irregularities in the track, and if he is the proper kind of a foreman will exert greater efforts to repair the trouble quickly. He also comes to have more confidence in the roadmaster.

I also believe in having foremen go over adjacent sections so as to see the progress being made by his neighbor, and I believe this broadens his views and oftentimes he is able to grasp helpful ideas, especially with reference to general instructions with regard to doing work in standard ways.

R. J. O'CONNOR,

Roadmaster, Chicago, Milwaukee & St. Paul, Savanna, Ill.

#### Sixth Answer

It is advisable to have foremen, especially the young men who have just been made foremen, to ride over their sections occasionally on locomotives or trains. A new foreman may not know just what action, or how much action, rail out of line, out of surface, or out of gage, will have upon the train, and just what the effect is upon a passenger.

It is well not only to have them ride on the engine and the rear car at times, but also to have them ride some car in the middle of the train. If they find there is a very bad place which is easily felt on the train they can repair it and then ride the train again to see if their work has remedied this condition.

T. J. IRVING,

Division Engineer, Chicago & North Western, Winona, Minn.

### Storm Windows for Railway Buildings

*To what extent it is practical to equip railway buildings with weather strips or storm windows?*

#### First Answer

The Northern Pacific, for the greater portion of its mileage, runs through a cold country. The expense of heating its buildings is a large item. For some years we have made it a practice to equip our buildings with storm windows. This practice has been followed on depots, both first and second class, on roundhouses, division headquarters and on various minor structures such as yard offices, etc. We have also generally equipped our section houses with storm windows although, the company does not furnish fuel for heating these houses. This has been done on the basis of giving our employees proper housing facilities at outlying points in order to attract a better class of men.

We have not equipped our buildings with weather strips except in the case of three or four first-class

depots recently constructed. In those cases we installed weather strips and eliminated the use of storm windows in order to maintain the architectural features of the building. It is felt that storm windows are not entirely satisfactory for office buildings where a number of persons are congregated all day. There does not seem to be any reason why it is not practical to equip the ordinary railway building with storm windows and it is considered that the saving in coal and saving in attendance in keeping up fires, well repays the cost of installation.

BERNARD BLUM,

Engineer of Maintenance of Way, Northern Pacific, Lines East, St. Paul, Minn.

#### Second Answer

On the better class of depot buildings weather strips on doors or windows should not be required, as such requirements should be taken care of in the original construction. On smaller station buildings where the climate is cold, we find it practical to provide storm windows around the office portion of the building only. I do not think weather strips should be provided on station doors. On all section and living houses it is desirable to place weather strips on the doors and to provide storm windows on all the living rooms, but not the bedrooms.

D. ROUNSEVILLE,

Assistant Chief Engineer, Chicago & North Western, Chicago.

#### Third Answer

In the northern states and Canada storm windows should be considered a necessity for all buildings used for dwelling or office purposes. In this locality they are usually supplied for depots, office buildings and section houses. They are also used extensively on engine houses, pump houses and water tank housing. There is no doubt but that the fuel saving repays the cost in all cases; and that greater comfort and convenience is obtained.

While not so generally used it appears that equal saving can be obtained by use of weather strips. In districts where extreme weather conditions prevail, the weather strips should be used with storm windows and doors. Where milder weather is experienced weather strips may be used instead of storm windows. Probably the best policy is to provide storm windows and doors only, where moderately cold weather is experienced, and where extreme conditions are met to provide storm windows and doors with weather strips.

P. C. PERRY,

Division Engineer, Canadian National, Regina, Sask.

### Special Days for Scrap

*Is it advisable to set certain days of the week or month for section gangs to pick up scrap and debris?*

#### First Answer

It is advisable to have scrap gathered and other debris cleaned from tracks on specified dates because this is the only method of insuring that it will be done frequently. A further reason for specified dates is that it will help to maintain a uniform appearance. Every section foreman but one might gather scrap but the remaining one by leaving the scrap scattered over his section will spoil the appearance of the entire territory and may give to the traveling public the impression that none was gathered.

The frequency of clean-up days should vary with the importance of the track. On branch lines once per

month is sufficient. On main lines it should be done at least twice a month and in yards and about terminals at least once per week. Draw heads, pig iron and large scrap should be removed from the tracks or center ditches immediately and the trackwalker should be held responsible for reporting promptly the locations of the same to the section foreman. CHARLES J. LEPPERD,

Supervisor, Philadelphia & Reading, Pottstown, Pa.

#### Second Answer

It would be a very good practice to have a certain day of the week for picking up scrap and for cleaning up. I have, for some time, used my crew one half a day each week for picking up scrap iron, for general cleaning up around station grounds, including the removing of cinders from tracks, burning and removing weeds, and also in making small repairs to switches, crossing signs, etc. I generally take Saturday afternoons for the work and have found this to be good practice because then I'll have my section cleaned up for the next week besides having the section look nice for the Sunday travelers on trains.

THOR MONRAD,

Section Foreman, Northern Pacific, Ollie, Mont.

#### Third Answer

Every foreman who is up to date will adopt a schedule to work by. Foremen who work to a haphazard plan, who do not lay out their work ahead of time, do not get the desired results from their men. Every hour has to count on the job and the foreman who begins to plan his work for the day after he has begun work will lose the interest of the men and will not get results.

G. E. STEWART,

Assistant Engineer, Southern Pacific, Stockton, Cal.

#### Fourth Answer

Usually it is advisable to set a certain day of the week to pick up scrap and debris. This should be done when the traffic is least heavy since when there are only a few trains passing, more of the section can be covered. Monday is usually a good day to do this on the Philadelphia & Reading, as a majority of the industrial works are only operated 5 or 5½ days a week, so that on Mondays there are not as many trains as on other days. If trackwalkers, when covering the section, and when time will permit, will gather scrap, etc., and place it in small piles, there will be considerable time saved for the gangs on the set days for gathering scrap.

A. BOLOGNESE,

Foreman, Philadelphia & Reading, Royersford, Pa.

#### Fifth Answer

Section foremen should require their gangs to pick up scrap at the end of each day's labor and take it to the bin at the toolhouse. An old pail carried on the car serves a dual purpose, being a receptacle for small scrap, and also a reminder that it is there for that reason. If this system is adhered to, it will be unnecessary to detail one or more days per month to pick up scrap.

W. R. MAYNE,

Foreman, Canadian Pacific, Thompson Siding, B. C.

#### Sixth Answer

It is my practice to have the section gang pick up scrap each day as they go along and bring it in and leave it at the tool house. Setting certain days of the week or month for the picking up of the scrap means that there will be some scrap lost, as a great many times after the day's work there are scrap bolts, nuts and spikes which if not picked up on that particular day are apt to become covered up—not only on the main line but particularly so in the yards.

We have set a certain day in the fall, after the right of way is burned and before snow comes, when section crews make a general clean-up of the entire right of way. In this way they find scrap which has been thrown out into the grass and which they could not otherwise find. In the spring we do the same thing again, after the snow is gone and before the grass starts to grow.

T. J. IRVING,

Division Engineer, Chicago & North Western, Winona, Minn.

#### Seventh Answer

On the usual section and in terminals, I do not think it advisable to set aside any particular time for picking up scrap or debris. Scrap made during the day should be collected daily and taken to the tool house. It has been my experience that section crews and gangs are always capable of taking the necessary material out with them each day to make the necessary repairs and they should experience no trouble in taking the scrap recovered to the tool house where it can be properly sorted and easily loaded when scrap cars go over the line.

Old ties or timbers as well as fence posts, where fence repairing is being done, should be piled each day and burned the following day when the fire can be watched—unless close to some terminal where these timbers can be loaded and used for engine wood at a small cost.

In large terminals and especially switching yards, care should be used to see that all scrap, etc., is cleaned up each day. This will not only give the yard a better appearance but also eliminate chances of personal injuries or result in slowing up the work of switching in making up trains.

R. J. O'CONNOR,

Roadmaster, Chicago, Milwaukee & St. Paul, Savanna, Ill.

### Blasting Drilled Wells for Water

*Can explosives be used effectively in a drilled well to increase the flow? Under what conditions and how should they be used?*

#### First Answer

The use of explosives to increase the flow from a drilled well should not be recommended except as a last resort, as where the drilled hole would otherwise be a failure. In many oil wells an increase in yield has been obtained by torpedoing with nitroglycerin. This method has no doubt led to the idea that the yield from a deep well can be increased by a similar method. It must be remembered that a deep well is expected to be far more permanent than an oil well and too expensive a structure to run a risk of ruining it. Torpedoing a well usually not only makes it impossible to sink it deeper but also to repair it at any time. I know of several wells in which explosives have been used to increase the flow, but of no wells in which the flow therefrom has been sufficiently increased to justify such a violent method.

At Vinton, Iowa, in 1910 two adjacent deep wells needed repair of the same nature and extent. In attempting to pull up a corroded casing in one of the wells several shots of high explosives were fired and the drill hole was so damaged that the total cost of the repairs exceeded \$7,400, whereas the repairs on the other well, made by an experienced well company, cost but \$1,600.

The first step in remedying decreased yield is to discover whether the trouble is not in the well itself. Even when properly constructed, the mechanism of a deep well cannot be expected to last indefinitely. The casing in time will rust out, the packing will deteriorate with age, screens will become incrustated and the flow of the water stopped. The art of finishing drilled wells,

remedying incrustation and developing the flow should be more carefully studied by those desiring to increase the flow from drilled wells. If this is done, I believe there will be less explosives used in drilled wells in an attempt to increase the flow.

F. D. YEATON,  
Assistant Engineer, Chicago, Milwaukee & St. Paul, Chicago.

#### Second Answer

Explosives can be used effectively to increase the flow of water providing there is a water-bearing stratum of rock or gravel in the vicinity. The explosives should be fired at the point where the water was encountered in the drilling of the well. If the well contains a casing, the water should be pumped out to a point well below the casing before firing the shot. If it is impossible to pump out the water, the casing should be pulled out.

The amount of charge will depend on the depth of the well, its distance from surrounding buildings and the nature of the rock, and will probably vary from 100 to 300 lb. for a well 100-ft deep. An explosive known as du Pont Solidified Nitroglycerin gives the best result, but if this is not obtainable, sixty per cent straight dynamite will work satisfactorily, providing the column of water is not over 200-ft high.

ARTHUR LA MOTTE,  
Manager, Technical Section, E. I. duPont deNemours & Co.,  
Wilmington, Del.

[In responding to the editor's request upon his specialized experience in providing an answer to this question, Mr. La Motte has also submitted a bulletin entitled "Blasting Drilled Wells to Decrease Flow of Water," to which readers are referred for further and more detailed information on the subject. This booklet is an outline of the methods that have been found practical in many instances and is to be had by writing the duPont Company.]

### Filters for Water Supplies

*What is the difference between gravity and pressure filters and what considerations determine which should be selected?*

The difference between gravity and pressure filters is that a gravity filter is usually open at the top, while a pressure filter is a closed vessel. Pressure filters, however, will operate as gravity filters if the water flows to the filter under a gravity head. Gravity filters are, as stated, almost invariably open at the top, and they may be made circular or rectangular in form. The rectangular type are usually built of masonry or reinforced concrete. Where circular gravity filters are used they are usually made of wood, but sometimes of steel or concrete. Pressure filters are usually made of steel for working pressures varying from 50 lb. up to 150 lb.

Local conditions usually determine whether a pressure or gravity filter is best adapted. With gravity filters it is usually necessary to pump twice, first from the source of supply to the filter, and again from the receptacle into which the filter discharges. With pressure filters only one pumping is necessary, and this is often a determining factor.

As a general proposition pressure filters are used where the water to be filtered is not excessively turbid, where conditions are favorable and where only one pumping can be allowed. Gravity filters are used where the water to be filtered is excessively turbid, a settling basin being used ahead of the filter to remove a large proportion of the suspended matter.

The rate of filtration through both pressure and gravity filters is the same. As a general proposition pressure filters are preferred where the water to be filtered is not

very turbid and where double pumping is an objection. Gravity filters are used almost exclusively for municipal work where high bacterial removal and economy in cost for operating are most essential.

GEORGE F. HODKINSON,  
Manager Filter Department, American Water Softener Company, Philadelphia, Pa.

### Hair Cracks in Concrete

*What is the cause of hair cracks in concrete? How can they be prevented? Are they a cause for anxiety?*

#### First Answer

Hair cracks in concrete surfaces are usually caused by too rapid drying out of concrete surfaces. A few months ago the writer saw a sidewalk in St. Augustine, Fla., that had been laid on a hot day in 1922. All the panels except one had been covered with tar paper immediately after finishing to protect them from the hot rays of the sun, and were free from hair cracks. In one panel, however, there had been a delay of less than an hour in covering it with tar paper and its surface contained many hair cracks. This is of course an extreme case, due to the hot climate, but it illustrates the point.

Contributing causes of hair cracks are the use of too much mixing water, too fine sand, excessive use of the steel trowel in finishing the surface and sprinkling dry cement or a mixture of dry cement and sand on the surface to facilitate the work of finishing. Concrete and mortar mixtures containing too much water shrink in hardening much more than mixtures containing the proper amount of water, and hair cracks are more apt to form in them. Using a steel trowel to finish a concrete or mortar surface tends to bring the fine particles of cement to the surface and to break the bond that has already started to form. Dry cement sprinkled on the surface to facilitate finishing does not hydrate nor bond well and may cause the surface to dry out too rapidly.

Hair cracks can be prevented by good workmanship in placing and finishing concrete and stucco. Only enough mixing water should be used to attain a plastic consistency, the use of fine sand should be avoided, the amount of steel troweling minimized, sprinkling of dry cement or cement and sand on the surface in finishing prohibited and the concrete protected from drying out too rapidly. It does not cost much to cover the forms or exposed surfaces with canvas or tar paper and to wet them down frequently.

Floors, pavements and sidewalks can be flooded with water the day after they are laid, when they have hardened enough to prevent injury thereby, or they can be covered with a layer of damp sand at small expense. Keeping the concrete wet the first ten days will add over 65 per cent to its compressive strength and resistance to abrasion.

Hair cracks, unless very extensive and very deep, do not injure the concrete and need not cause anxiety, although they do detract from its appearance and are therefore objectionable on exposed surfaces.

D. A. TOMLINSON,  
Manager Railways Bureau, Portland Cement Association,  
Chicago.

#### Second Answer

Hair cracks in concrete are caused by (1) surface expansion and contraction due to changes in temperature, and (2) surface contraction caused by shrinkage of the concrete when setting.

There may be some other causes as I have seen cases where concrete of an extremely dry and extremely wet

consistency have cracked and also many cases where the same classes of concrete are in perfect condition, but what this cause is or how it may be controlled is not apparent.

Cracks of the first class cannot be entirely prevented but can be reduced and confined to surface cracks by the use of a grid of reinforcement placed far enough away from the surface to prevent its corrosion. Cracks of the second class can be minimized by use of concrete of the proper consistency, eliminating the excess mixing water.

My experience has been that these cracks are not a cause for anxiety excepting on exposed surfaces, which retain moisture and are subject to alternate freezing and thawing. For instance, I have seen cases where the top of the parapet wall on concrete slabs, and in some cases the face of the slabs has deteriorated badly while the bottom side of the slabs and the part protected by the ballast is in perfect condition. The deterioration does not extend far from the surface, usually a maximum of two or three inches. The concrete in these cases is about 15 years old, and the number of cases of this deterioration, as compared with the amount of concrete in service, is very small indeed.

G. A. HAGGANDER,

Bridge Engineer, Chicago, Burlington & Quincy, Chicago.

### Splicing Foundation Piles

*Is it good practice to splice foundation piles? How should the splices be made?*

#### First Answer

It is not desirable to splice foundation piles unless the conditions make it necessary to do so. However, we have a good many foundations supported on spliced piles which have not settled and have proven satisfactory.

The most satisfactory splice I know of is made by using 10-in. or 12-in. wrought iron pipe, 30 inches long with a  $\frac{3}{4}$ -in. piece of round iron, driven through the pile above the splice and bent down about six inches over the iron pipe in order to keep the splice from creeping up. In driving spliced piles, it is desirable to vary the length of piles so that the splices will not occur at the same elevation.

A. DANIELS,

District Engineer, Chicago, Milwaukee & St. Paul, Minneapolis, Minn.

#### Second Answer

In general I do not consider it good practice to splice foundation piles. If the foundation piles are to be used under an abutment, or any other part of the substructure where there is or may be lateral pressure, the spliced piles do not give the resistance to lateral pressure that full length piles should. Again, in the case of piers where the lateral pressure may be very light or negligible, it is not good practice to splice piles, on account of introducing a joint in the structure supporting a pier, which weakens the supporting piles.

If, however, long enough piles cannot be obtained for full length driving or if for any reason full length piles cannot be set up under the hammer, so it is necessary to use spliced piles, the piles should preferably be half-lapped, spliced with a lap of perhaps three feet, with the two parts cut square ended and the ends of both piles butting tight onto the other pile, giving a firm bearing the full size of the smaller pile. The lap should be firmly bolted, and both ends of the lap should be banded. In driving the upper pile down on top of the lower one, it will generally be necessary to use lighter blows in order

to avoid damaging the pile at the splice or perhaps forcing it entirely off the lower pile.

Another way of splicing piles, while not as satisfactory, is to drive the lower pile down as far as possible, band the top and bore the butt for a dowel pin. The small end of the upper pile is also banded and bored for the dowel pin, which is then driven in with a tight fit, leaving from 18 to 24 in. projecting out of the pile. This pile is then set on the lower pile with the dowel pin inserted in the hole already bored in the lower pile. By careful driving, piles spliced in this way can generally be driven down to a good resistance. I have spliced piles in this way for pile trestle bridges and have never had trouble with them on account of the splices. However, for any important foundation work, I should much prefer full length piles in order to afford a firm, rigid support for the abutments or piers to be placed upon them.

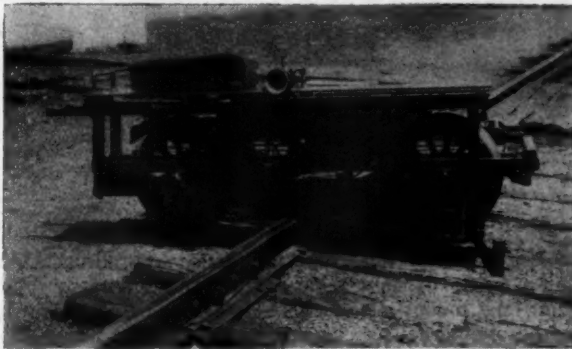
R. H. REID,

Supervisor of Bridges, New York Central, Cleveland, Ohio.

## Home Made Skid Makes Motor Car Handling Easier

THE PRODUCT of a signal man's ingenuity, which may be used to equal advantage in maintenance of way, has recently presented itself in the form of a skid for facilitating the handling of motor cars when removing them from the track or putting them on. The device originated with a signalman on the St. Louis-San Francisco, who conceived the idea that an additional bar attached to the under side of the frame of the car on the inside would prevent the wheels from dropping down on the ties when the car was swung crosswise with the track preparatory to removing it.

An old iron-bed rail made of  $1\frac{3}{4}$ -in. angle iron furnished the equipment with which to put the idea into



The Skid Rail Keeps the Rear Wheels from Dropping Down on the Ties

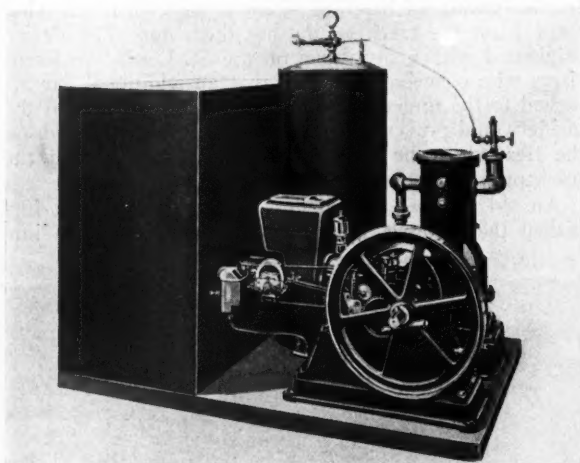
effect. Preparatory to attaching this iron to the car the ends were cut off and offsets made so that when bolted to the bottom of the inside frame rail, the edge of the angle iron would be about two or three inches above the running rail when the car was on the track. Having shaped the iron in this fashion it was a small matter to drill holes for bolts and attach it to the frame. The illustration shows how the wheels are held up off the ties by such advice. While slightly increasing the weight of the car the skid bar has lived up to expectations in service, being of special value when the operator has no one present to assist him when lifting the car off the track.

# NEW DEVICES

## The Mechanical Paint

### Sprayer Perfected

THE illustrations show two arrangements of a form of mechanical paint spraying equipment, which constitutes the product of several years of development. The plan followed in perfecting this equipment has been to design separate units for different situations and to give special attention to the design of the sprayer.



The Mathew's Equipment Ready to Mount on a Motor Car

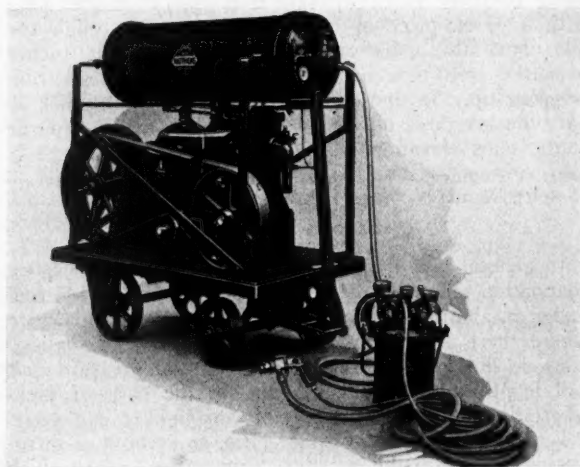
For work which is accessible only by railroad, the unit consists of a gasoline engine, air compressor and paint tank mounted on a 40-in. by 60-in. base, as shown in the photograph, such an arrangement permitting the ready handling of the equipment on a trailer behind a motor car. The weight of this outfit, 985 lbs., is also such that there is no difficulty in handling it to and from a car and there is nothing in the mechanical construction subject to damage by exposure to ordinary weather conditions. For use around terminals and for the interiors of large buildings the portable equipment shown in the other photograph is provided except where it is desired to use electricity, when a unit is provided in which an electric motor is substituted for the gasoline engine.

The paint gun which is the outstanding detail of the new equipment is constructed to handle a variety of materials ranging from cold water paint to those of an asphaltum base. All air and paint passages are straight and no contact of air and paint is allowed except at the extreme end of the nozzle. The air valve and a paint valve are in the body of the gun and are readily acces-

sible. The principal feature of the gun, however, is a form of construction which is said to maintain an air envelope around the paint cone during the painting. The air in this outlet envelope, being free of the weight of the paint, travels faster than the air of the inner section which carries paint particles. The result is that practically the entire quantity of paint is delivered effectively with very little escaping into the air as mist. While this feature makes the gun particularly adaptable for interior work the important advantage lies in the fact that the painter is not bothered by mist when painting.

This equipment, which is a product of the W. N. Mathews Corporation, St. Louis, Mo., is now in service for paint and varnish work of various kinds, where, generally speaking, a reduction of some 40 to 60 per cent is being accomplished in the labor cost over that required by the brush method.

While service records concerning this equipment are limited in number at the present time, the report is made



Gasoline Operated Outfit Designed for Use Around Terminals

that on a 65,000-bbl. oil storage tank, a crew of two men applied one coat of paint at the rate of 6,000 sq. ft. per hour, this figure taking into account the time required to fill the paint container, shift equipment, etc. In another instance on a low tank, where scaffolding was not required, an operator and one helper applied a single coat at the rate of 45,000 sq. ft. per eight hour day. Again, in a building of concrete construction, two gun operators with four helpers to shift scaffolding, mix and

strain paint, fill the paint pot, etc., applied cold water paint to the interior at the rate of 8,000 sq. ft. per eight hour day and oil paint at the rate of 18,000 to 22,000 sq. ft. per day.

### A Gasoline-Operated Dipper Shovel

**T**HE PREFERENCE shown for gasoline power over steam in many situations where earth-handling machinery is useable, particularly where it is desired to employ such equipment at some distance from railroad tracks, or to avoid the use of tracks because of the conditions under which the work must be conducted, has induced another manufacturer of such equipment to attempt the solution of the problem of adapting this power to the dipper shovel. The principle difficulty encountered in this respect, has been in providing for a reversible crowding motion of the dipper stick, a need which is met in the steam-operated shovels by the means of a small independently operated steam engine geared directly to the shipper shaft.

In the new machine, which is a product of the Orton & Steinbrenner Company, Chicago, the problem has been met without requiring any elaborate change in the design



The New Gasoline Dipper Shovel, Showing the Position of the Crowding Mechanism.

of the shipper shaft and dipper stick by means of a gear drive. At the bottom of the boom is a shaft carrying double steel beveled gears located concentrically with the pivot of the boom, this arrangement permitting the boom to be operated at any angle. Along the boom is a steel shaft carrying two beveled pinions, the one at the bottom meshing with the gears on the horizontal shaft just described, and the one at the top connecting with gears on a counter shaft located about half way up the boom. This latter shaft carries a brake and slip friction and is geared directly to a cast steel rack on the dipper stick. This arrangement, being free from sprocket and chain equipment and from cables and sheaves, promotes facility and certainty in the operation of the dipper and protects the operator from the fatigue of more elaborate mechanism.

The hoisting mechanism is similar to that used in the locomotive cranes built by the company and described in earlier issues of *Railway Engineering and Maintenance*. The power is supplied by a heavy duty four-cylinder Climax motor and the steam shovel travels on flexible crawling treads. These treads adjust themselves readily to the ground and aside from permitting the movement of the machine over extremely irregular ground, affords adequate stability to the dipper.

In keeping with the present tendency and practice in the construction of such machines, the shovel may be converted into a crane or clam shell outfit, or drag line or

a skimmer rig. When used as a crane, it is necessary only to take off the shovel boom and attach a crane boom, the crowding friction for operating the dipper being carried by the shovel boom and being removed with it. With the crane boom attached, any of the various types of buckets or scoops can be used.

### A Long Service Life for Creosoted Yellow Pine

**A**FTER 21 years of service the stringers and planking in the floor system of the Reading terminal of the Philadelphia & Reading at Philadelphia, Pa., were found to be in an excellent condition. This timber construction was of creosoted yellow pine, the treatment consisting of 12-lb. of creosote per cu. ft. Being perfectly sound the timbers were continued in use, the only repairs necessary being the renewal of the waterproofing.

The floor system of the Reading terminal consists essentially of 10-in. by 12-in. creosoted yellow pine stringers supported by and bolted to longitudinal lines of steel girders. The spaces between the stringers and between the stringers and the platforms were floored over with



A Part of the Floor System—Still Sound After 21 Years' Service

two-inch creosoted yellow pine planking, sloped toward the center of the track for drainage. The rails were supported upon the stringers through the medium of 2-in. by 10-in. by 12-in. oak blocks laid upon the stringers at tie-space intervals. Spiking was through the blocks into the stringers.

When this flooring was waterproofed recently, the rail and oak blocks were removed and all old spike holes, etc., plugged. A layer of two-ply felt was applied over the two-inch planking and a layer of three-ply asphalt saturated fabric over the stringers, the edges of which had been previously beveled. The layer of three-ply fabric overlapped that of the two-ply after which the spaces between the stringers, i. e., over the two-inch planking, was given a 1½-in. coating of asphalt mastic with 1½-in. fillers of elastic cement at the stringers.



### American Railway Engineering Association

The Board of Direction of the American Railway Engineering Association will hold a meeting in the New York Central offices, New York City, on the morning of November 7. This will be followed in the afternoon by a meeting of the general committee of the Engineering division of the American Railway Association.

One of the committees of the A. R. E. A., namely, that on Shops and Locomotive Terminals, has filed its report with the secretary for publication. The reports of some of the other committees are expected within a short time.

### Roadmasters' Association

Tentative arrangements have been made for holding the New York convention next September in the Hotel Commodore. This may require some modification of the exact date of the convention, although this has not been definitely determined. It is expected to hold a meeting of the officers and executive committee early in November.

### Maintenance of Way Club of Chicago

The Maintenance of Way Club of Chicago held a meeting at the Auditorium hotel, Chicago, following a get-together dinner, on the evening of October 17. The presiding officer for the evening was D. J. O'Hern, second vice-president, who acted in the absence of both President Hillman and First Vice-President Thompson. Owing to the fact that the regular speaker of the evening, R. H. Ford, assistant chief engineer, Chicago, Rock Island & Pacific, was called out of town unexpectedly on account of serious flood damage to the Rock Island lines in Oklahoma, the program for the meeting consisted of a round-table discussion on the recruiting and training of section foremen, the discussion being preceded by the reading of three of the contest papers on this subject, which appear elsewhere in this issue.

The next meeting of the club will be held at the Auditorium hotel on November 14, the speaker being J. R. Watt, general roadmaster, Louisville & Nashville, who will give a talk on the organization and system observed on the Louisville & Nashville in the maintenance and operation of motor cars by the maintenance of way and signal forces.

## The Material Market

**A**LTHOUGH but few actual recessions in price have been noted there are definite manifestations of a curtailment of business in the iron and steel market. The fact that the prices of pig iron have been reduced \$2 or more per ton is significant even though few changes have taken place in the quotations of finished products. Therefore, it may be reasonably concluded that the prices given in the table below are maximum prices with the possibility of large orders being awarded at some deviation from the figures shown. With the reduction in business from other lines, the mills are turning more to the railroads for business immediately in sight and orders for

rails and track fastenings continue as an important feature of the steel market.

### PRICES IN CENTS PER POUND

	September 20		October 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes.....	3.15	3.25	3.15	3.25
Track bolts.....	4.00 to 4.25	4.25	4.00 to 4.25	4.25
Angle bars.....	2.75	2.75	2.75	2.75
Tie plates, steel.....	2.55 to 2.60	2.60	2.55 to 2.60	2.60
Tie plates, iron.....		2.85		2.85
Plain wire.....	2.75	3.09	2.75	3.19
Wire nails.....	3.00	3.34	3.00	3.34
Barbed wire, galv.....	3.80	4.14	3.80	4.14
C. I. pipe, 6 in. to 12 in., per ton.....		\$60.20		\$57.20
Plates.....	2.50	2.60	2.50	2.60
Shapes.....	2.50	2.60	2.50	2.60
Bars, soft steel.....	2.40	2.50	2.40	2.50

Open hearth rails per gross ton f. o. b. mill, \$43.

The condition of the scrap market also appears to represent a manifestation of the status of the entire industry, although this does not necessarily follow in all cases. At any rate, the prices for scrap represent appreciable reductions from those of a month ago.

### PRICES PER GROSS TON AT CHICAGO

	September	October
	September	October
Relaying rails.....	\$32.00 to \$35.00	\$32.00 to \$35.00
Rails for rerolling.....	17.50 to 18.00	15.50 to 16.00
Rails less than 3 ft. long.....	20.50 to 21.00	17.50 to 18.00
Frogs and switches cut apart.....	16.75 to 17.25	14.50 to 15.00
Steel angle bars.....	18.50 to 19.00	16.00 to 16.50

The lumber market appears to be on a rather stable basis. The table below shows minor deviations from the quotations of last month but indicates no general trend in either direction. Orders for lumber in the southern pine and Douglas fir areas maintain a volume well up to the expectations for this season of the year.

### SOUTHERN PINE MILL PRICES

	September	October
	September	October
Flooring, 1x4, B and B flat.....	\$44.55	\$44.90
Boards, 1x8, No. 1.....	34.95	37.85
Dimension, 2x4, 16, No. 1, common.....	26.05	26.60
Dimension, 2x10, 16, No. 1.....	25.95	27.80
Timbers, 4x4 to 8x8, No. 1.....	29.55	29.15
Timbers, 3x12 to 12x12, rough.....	40.70	40.35

### DOUGLAS FIR MILL PRICES

	September	October
	September	October
Flooring, 1x4, No. 2, clear flat.....	34.00	35.00
Boards, 1x6, 6x20, No. 1, common.....	18.50	18.50
Dimension, 2x4, 16, No. 1, common.....	18.50	19.50
Dimension, 2x10, 16, No. 1, common.....	18.50	19.50
Timbers, 6x6 to 8x8, No. 1, common.....	27.00	26.00
Timbers, 10x10 to 12x12, rough.....	25.00	25.00

No changes have been noted in the prices of Portland cement in recent weeks. Below are quotations in carload lots per barrel, not including package:

Chicago.....	\$2.20	Albany.....	\$2.47
Cincinnati.....	2.54	Buffalo.....	2.53
Davenport, Ia.....	2.43	New York.....	2.40
Minneapolis.....	2.50	Philadelphia.....	2.56
Pittsburgh.....	2.24	Richmond, Va.....	2.62
Boston.....	2.78	Charleston, S. C.....	2.71

**TRANSPORTATION GOAL REACHED.**—On October 1 the railroads had more than attained one of the principal objectives set up in a program to provide adequate transportation for 1923, in addition to handling a greater volume of traffic than was expected at that time. The monthly progress report, as of October 1, shows that the number of locomotives awaiting heavy repairs had been reduced to 8,789, or 13.7 per cent, as compared with an objective of 15 per cent. The number of locomotives awaiting both heavy and light repairs was 15.3 per cent of the number on line, as compared with 24.1 on January 1 and 16.5 on September 1. The number of freight cars awaiting repairs had been reduced on October 1 to 6.7 per cent, as compared with the objective of five per cent. While the objective of five per cent was not reached in the case of freight cars, gratification is expressed over the reduction that has been accomplished, as is apparent when it is considered that the percentage was 7.7 on September 1, 9.5 on January 1, 12.8 per cent on October 1, 1922, and 15.8 per cent on October 1, 1922.

# General News

The Alaska railroad suffered damages from floods caused by heavy rain during the early part of October which temporarily required the discontinuation of operations over about 100 miles of the line, much track having been washed out and bridges being damaged.

The president of the American Society of Civil Engineers has been asked by the Board of Direction to appoint a committee to collect information on the effect of earthquakes on structures. It is recommended that the American Society undertake this study in co-operation with other national societies. The committee has not yet been selected.

On October 10 the Chicago, Rock Island & Pacific observed the seventy-first anniversary of its birth by celebrations in several places, the principal function being a banquet held at Chicago on the evening of the 10th under the auspices of the Rock Island Club. On October 24 somewhat similar activities were held in Chicago by the Chicago & North Western in commemoration of the seventy-fifth anniversary of the opening of that road, the North Western being the first steam railroad to enter Chicago.

During October an estimated loss of \$950,000 was sustained in the course of a week by three fires to railway and adjacent property, the Southern railway having sustained a \$300,000 loss on October 11 when a fire destroyed car shops and equipment at Gadsden, Ala., and the Pennsylvania suffering a loss of about \$500,000 on October 15 when similar property was destroyed at Camden, N. J. Only four days before the fire at Gadsden, the Southern railway also lost a coal chute and considerable rolling stock at Selma, Ala., from a like cause.

The Interstate Commerce Commission has authorized the Detroit, Toledo & Ironton, owned by Henry Ford, to carry out a proposed method of improving relations between employer and employee whereby the company proposes to issue investment certificates to employees in denominations of \$100, \$500 and \$1,000, similarly as has been done by the Ford Motor Company with its employees. These investment certificates are to bear interest at the rate of six per cent per annum and are available to any employee. Payment is made on a partial payment plan.

The net railway operating income of the 193 class I railways for August was at the rate of 4.94 per cent upon their tentative valuation, plus additions and betterments to January 1, 1923, according to preliminary compilation. For the Eastern District the rate of return was 5.16 per cent, for the Southern District 5.38 per cent and for the Western 4.6 per cent. Sixteen roads had deficits for the month. The operating revenue for August showed an increase of 19 per cent, as compared with August, 1922, while operating expenses showed an increase of 10 per cent.

One of the most disastrous wrecks in the experience of the Chicago, Burlington & Quincy occurred at Lockett, Wyo., on September 27, when the sudden collapse of a pile trestle bridge over Cole creek, undermined by unprecedented flood waters, collapsed and hurled a passenger train into the flood waters. Four persons are known to have drowned and over 30 more of the total of 75 persons on the train were unaccounted for following the wreck. The bridges, which was 111 ft. long, gave way, it is believed, when the locomotive was about one-third of the distance across. The locomotive and tender, the mail coach, baggage car, smoking car and the chair car were completely submerged and the first three sleeping cars were partially submerged, leaving only

two cars on the track. Rescue work was greatly handicapped by the continuous rain and snow storm and the constantly rising waters, the water in the creek bed, which is ordinarily dry, having risen to such an extent that the creek was over 100 ft. wide at the time of the wreck. The washing out of other bridges and track in the vicinity by floods only last July necessitated the rebuilding of a large portion of the line, which was put out of commission by the disaster at Cole Creek.

A gravel washing, screening and crushing plan has recently been completed on the Illinois Central near Freeport, Ill., the interesting feature of which is the employment of a dredging process to excavate and deliver all gravel to the plant. The plant, which comprises a barge equipped with a 12-in. centrifugal gravel pump, is found to be less expensive of operation than a steam shovel and gravel trains and presented the additional advantage of making available a large amount of gravel lying below the surface of the ground water. The material passes from the barge to the plant through a 12-in. pipe line which is carried on pontoons.

A report of the Interstate Commerce Commission shows that accidents at grade crossings are on the increase, 1,810 persons having been killed in 1922 and 5,382 injured, as compared with 1,705 fatalities and 4,868 persons injured in 1921 and 1,791 persons killed and 5,077 persons injured in 1920. The bulk of these accidents are shown to have been automobile accidents. A table in the report gives the total number of grade crossings in the United States in 1922 as 256,362, which include 7,087 crossings with other steam railroads and 4,583 with electric, interurban or street railways, leaving 241,692 crossings with highways. During the year, 705 crossings were eliminated.

What is said to be a new record in moving large buildings was established recently in Chicago when a seven-story brick office building of the Illinois Central, 80-ft. by 130-ft. and weighing 8,000 tons, was moved 90 ft. to provide for street widening incident to the terminal improvement work being done by the company in that city. The age, condition of the building and its position with respect to one of the heavy traffic boulevards of the city, also the presence of water in the excavation, which was carried to clay  $1\frac{1}{4}$  ft. below the level of Lake Michigan, complicated the problem. The building was moved on steel rails supported on a heavy timber grillage, the transfer being made without mishap.

A project for the construction of 20 miles of new double track railroad, including a new crossing of the Niagara river about midway between Buffalo and Niagara Falls, is the most recent step to be announced by the New York Central in its plans to meet the requirements of its traffic. This project is being undertaken jointly by the New York Central and the Canadian Pacific and extends from a connection with the existing line of the Michigan Central near Welland, Ont., across the east and west branches of the Niagara river and Grand Island, to a connection on the American side with the Niagara branch and the Tonawanda branch of the New York Central near the city of Tonawanda, N. Y. Two corporations have been created for the purpose of carrying out the project, the Canadian Niagara Bridge Company for the section of approximately 9 miles in Canada, and the American Niagara Bridge Company for the 11 miles on the American side of the International boundary. The latter company will also build a large classification yard on Grand Island.

## Personal Mention

### General

**George LeBoutillier**, vice-president of the Long Island and an engineer by education and early experience, has been elected president to succeed Ralph Peters, who died on October 9. Mr. LeBoutillier was born on February 2, 1876, at Cincinnati, Ohio, and was educated at the University of Cincinnati. He entered railway service on August 1, 1895, as a rodman on the Pennsylvania, lines west, becoming an assistant division engineer on November 1, 1900, and division engineer on July 1, 1903. He was promoted to division superintendent on February 1, 1914, and continued in that capacity until March 1, 1920, when he was promoted to general superintendent, with headquarters at Harrisburg, Pa. His connection with the Long Island, a subsidiary of the Pennsylvania, began early in the present year, when Mr. Peters, who was approaching the age of retirement, chose Mr. LeBoutillier to succeed him, Mr. LeBoutillier thereupon becoming vice-president and gradually taking up the management of the property.



George LeBoutillier

**Charles B. Petticrew**, whose promotion to division superintendent on the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., was reported in the October issue, was born on November 21, 1886, at Franklin, Ohio, and was educated at Purdue University, graduating in 1909. He entered railway service in 1904 as a section laborer on the Cleveland, Cincinnati, Chicago & St. Louis and was so employed until March, 1905, when he began his studies at Purdue University. During this period of study he was employed intermittently in the engineering department of the Cleveland, Cincinnati, Chicago & St. Louis. On the completion of his work at Purdue he entered the service of the Missouri Pacific Railway and was employed consecutively as ballasting inspector, as assistant engineer, roadmaster and division engineer until April, 1916, when he was promoted to division engineer on the Missouri, Kansas & Texas. He left the service of this road in April, 1920, as trainmaster to become division engineer of the St. Louis Southwestern, in which capacity he served until his recent promotion to superintendent of the southern division of this road.

### Engineering

**L. L. Coffey** has been appointed assistant engineer on the Missouri Pacific, with headquarters at Coffeyville, Kan., to succeed **F. A. Farah**.

**W. H. Featherstonhaugh**, acting district engineer of the Canadian National, with headquarters at Prince Rupert, B. C., has been appointed division engineer, with headquarters at Calgary, Alta.

**W. W. Drinker**, terminal engineer for the Port of New York Authority, has been appointed chief engineer. Mr. Drinker has been acting chief engineer since the death last January of **B. F. Cresson, Jr.**, chief engineer.

**W. H. Hulsizer**, assistant to the valuation officer of the Union Pacific, has been promoted to valuation engineer. Mr. Hulsizer was educated at Princeton University, graduating in 1907, and entered railway service in 1910 as an employee on system valuation. He has, since 1913, served consecu-

tively as office assistant engineer and as assistant valuation officer until his recent promotion.

**M. F. Longwill**, division engineer of the Detroit division of the Wabash, with headquarters at Montpelier, Ohio, whose promotion to assistant chief engineer of the Eastern district, with headquarters at St. Louis, Mo., is announced elsewhere, was born in 1884 at Indiana, Pa. He was educated at the Indiana State Normal School at Indiana, Pa., and at the Ohio Northern University, graduating from the latter in 1906, at which time he entered railway service with the Missouri Pacific. He held various positions in the engineering department of the Missouri Pacific until 1914, when he was promoted to roadmaster. From 1916 to 1917 he was resident engineer of the Union Railway of Memphis and from January 1, 1918, to October 1, 1923, has been division engineer of the Wabash, with headquarters at Montpelier, Ohio.

**T. L. Doyle**, who was reported in the October issue as having been promoted from assistant division engineer on the Logansport division of the Pennsylvania, with headquarters at Logansport, Ind., to division engineer of the Grand Rapids division, with headquarters at Fort Wayne, Ind., should have been reported as having been appointed division engineer at Grand Rapids pursuant upon the completion of construction work on the Pennsylvania-Detroit, a subsidiary of the Pennsylvania, where he was assistant chief engineer. Mr. Doyle's service as division engineer on the Logansport division was terminated in 1920 with the transfer as division engineer on the Mackinaw division, from which he was again transferred in 1921 to the Pennsylvania-Detroit railroad as assistant chief engineer.

**R. H. Howard**, who has been appointed chief engineer of the Wabash, with headquarters at St. Louis, Mo., was born on August 15, 1870, at Zanesville, Ohio. He entered railway service in October, 1889, as a draftsman on the Cincinnati & Muskingum Valley and was later promoted successively to assistant in the engineering department, chief clerk to the engineer maintenance of way and assistant engineer. In April, 1901, he was appointed assistant in the engineering department of the Pittsburgh, Cincinnati, Chicago & St. Louis and in July, 1902, was appointed assistant engineer on the St. Louis division of the Vandalia. Mr. Howard was appointed principal assistant engineer in charge of construction and improvements on the Chicago & Eastern Illinois in April, 1905, and in October of that year was promoted to engineer maintenance of way, in charge of all maintenance and construction work. From May, 1910, until January, 1911, he was engaged in special engineering work in connection with railroad properties for eastern financial interests. In January, 1911, he was appointed engineer maintenance of way of the New Orleans Great Northern, in charge of construction and maintenance. He was promoted to general manager in June, 1911, and held this position until May, 1915, when he was appointed chief engineer maintenance of way of the Wabash, with headquarters at St. Louis, Mo. Mr. Howard was holding this position at the time of his recent promotion to chief engineer, with the same headquarters.



R. H. Howard

**E. F. Manson** has been promoted to division engineer on the Chicago, Rock Island Pacific, with headquarters at Fairbury, Neb., to succeed **A. C. Bradley**, who has been transferred to Trenton, Mo., to succeed **A. C. Shields**, resigned to enter service with another company. **J. L. Hayes**, division engineer, with headquarters at Rock Island, Ill., has had his jurisdiction extended to the Chicago Terminal division upon

the assignment of **L. J. Hughes** to other duty, and **F. S. Thompson**, division engineer at Des Moines, Iowa, has had his jurisdiction extended to include the subdivision from Altoona to Keokuk and the Keosauqua branch due to the dismemberment of the Des Moines Valley division.

**J. F. McCurdy**, assistant division engineer of the St. Louis Southwestern, with headquarters at Pine Bluff, Ark., has been promoted to division engineer, with the same headquarters, succeeding **C. B. Pettigrew**, whose promotion to division superintendent was reported in the October issue.

**C. M. Barbour**, assistant engineer in the office of the electrical engineer of the Southern Pacific, with headquarters at San Francisco, Cal., has been promoted to assistant engineer in the office of the chief engineer of the lines in Texas and Louisiana, with headquarters at Houston, Tex.

**A. O. Cunningham**, chief engineer of the Wabash, with headquarters at St. Louis, Mo., has been appointed consulting engineer, with the same headquarters. **R. H. Howard**, chief engineer maintenance of way, with headquarters at St. Louis, has been promoted to chief engineer in charge of construction, maintenance of way and other engineering departments, with the same headquarters, succeeding Mr. Cunningham, the departments in charge of the chief engineer and the chief engineer maintenance of way having been consolidated. **M. F. Longwill**, division engineer of the Detroit division, with headquarters at Montpelier, Ohio, has been promoted to assistant chief engineer of the Eastern district, with headquarters at St. Louis, Mo. **J. J. Baxter**, division engineer of the Peru division, with headquarters at Peru, Ind., has been promoted to assistant chief engineer of the Western district, with headquarters at St. Louis. **R. L. Longshore**, assistant engineer, has been promoted to division engineer of the Detroit division and Detroit terminals of the Wabash, with headquarters at Montpelier, Ohio, succeeding Mr. Longwill. **H. O. Kelley**, division engineer of the Western division, with headquarters at Moberly, Mo., has been transferred to the Peru division, with headquarters at Peru, Ind., in place of Mr. Baxter. **J. T. Vitt**, division engineer of the Springfield division, with headquarters at Springfield, Ill., has been transferred to the Western division, relieving Mr. Kelley. **W. R. Bennett**, assistant engineer of the Western division, with headquarters at Moberly, Mo., has been promoted to division engineer of the Springfield division, succeeding Mr. Vitt. **F. C. Huntsman**, assistant engineer of the Springfield division, with headquarters at Springfield, Ill., has been transferred to the Western division, in place of Mr. Bennett. **J. C. Bousfield**, supervisor, with headquarters at St. Louis, Mo., has been promoted to assistant engineer of the Springfield division, with headquarters at Springfield, Ill., succeeding Mr. Huntsman. **R. D. Cope land** has been appointed assistant engineer, with headquarters at Moberly, Mo. **F. V. Marshall** has been appointed assistant engineer of the Decatur division, with headquarters at Decatur, Ill., and **C. E. Robinson** has been appointed assistant engineer of the Peru division, with headquarters at Peru, Ind.

### Track

**Thomas Binkley, Jr.**, has been promoted to acting supervisor on the Cincinnati division of the Pennsylvania, with headquarters at Xenia, Ohio, to succeed **A. J. Canny**, deceased.

**Nicholas Strunk**, whose promotion to track supervisor on the Southern, with headquarters at Williamstown, Ky., was reported in the October issue, was born at Winfield, Tenn., in 1880 and entered railway service in 1897 on the Cincinnati, New Orleans & Texas Pacific (a subsidiary of the Southern), since which he has been a section foreman for 15 years and extra gang foreman for 6 years, until his recent promotion.

**J. Dulin**, roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Oskaloosa, Iowa, has been appointed roadmaster from Des Moines, Iowa, to Keokuk, and of the Keosauqua branch. **E. Canan**, roadmaster at Cameron, Mo., has been transferred to Carlisle, Iowa, with jurisdiction to include the territory from Trenton, Mo., to Allerton, Iowa, and Winterset and Indianola, and **A. Burke**, roadmaster at

St. Joseph, Mo., has been appointed roadmaster, with headquarters at Trenton, Mo., with jurisdiction over the main line from Trenton to Cameron Junction, Mo., together with the Leavenworth, Atchison and Rushville branches.

**A. L. Pollock**, roadmaster on construction at Kingman, Ariz., has been appointed supervisor on the Albuquerque division, and **R. E. Patton** has been appointed acting roadmaster, with headquarters at Gallup, New Mexico.

**G. F. Bidwell** has been promoted to roadmaster of the Indio district of the Southern Pacific, with headquarters at Niland, Cal., to succeed **J. W. Starkey**, who has been transferred to the Colton district, with headquarters at Colton, Cal., to succeed **W. F. Monahan**, who has been appointed roadmaster of the newly created Los Angeles Terminal district, with headquarters at Los Angeles, Cal.

### Bridge and Building

**I. J. Newsome**, whose promotion to supervisor of bridges and buildings on the Southern, with headquarters at Birmingham, Ala., was reported in the October issue, entered railway service as a carpenter on the Southern on December 29, 1908, and continued in this capacity until June 2, 1913, when he was appointed roadway carpenter. He continued in this capacity until 1914, when he was appointed foreman of a bridge and building terminal gang at Birmingham. It was this position he held at the time of his recent promotion.

**J. L. Gass**, whose promotion to supervisor of bridges and buildings on the Southern, with headquarters at Selma, Ala., was reported in the October issue, was born on February 28, 1876, in Jackson County, Ala., and entered railway service as a laborer on the Alabama Great Southern, a subsidiary of the Southern, on August 31, 1897. He entered the bridge and building department as a carpenter on January 1, 1898, and on November 1, 1900, was promoted to bridge foreman, the position he was holding at the time of his recent promotion to supervisor on the Mobile division.

**J. H. John**, whose promotion to roadmaster on the Northern division of the Chicago, Milwaukee & St. Paul, with headquarters at Horicon, Wis., was reported in the October issue, was born on October 4, 1872, at Newtown, Mo., and entered railway service as a laborer on the Chicago, Milwaukee & St. Paul in 1888. He continued as a section laborer and as an assistant extra gang foreman until 1901, when he was promoted to section foreman, thereafter serving as section foreman and extra gang foreman until his recent promotion to roadmaster, his entire service having been with the Milwaukee.

**L. F. McMaster**, whose promotion to assistant supervisor of bridges and buildings on the Union Pacific, with headquarters at Omaha, Neb., was reported in the September issue, was born on November 10, 1879, at Bedford, Iowa, and entered railway service as bridge and building carpenter on the Union Pacific on August 15, 1910. He became a foreman on April 1, 1915, and was promoted to bridge inspector on July 1, 1917, thereafter continuing in this capacity until his recent promotion to assistant supervisor bridges and buildings.

**W. W. Walkden**, whose recent promotion to bridge engineer of the Canadian National, lines west, with headquarters at Winnipeg, Man., was reported in the October issue, was born on June 11, 1885, at Alderley Edge, Cheshire, England, and was educated in a school of technology at Manchester, England, following which he was indentured to a firm of architects, surveyors and engineers at Stockport, England, where he was employed in an indentured capacity and as an assistant until 1907. Migrating to Canada in 1907, he entered railway service on the Canadian Northern at Winnipeg, Man., where he was employed as draftsman in the construction department and as a designer until May, 1912, when he was promoted to chief draftsman. He continued as chief draftsman and later as assistant to the bridge engineer at Winnipeg until February, 1917, when he was promoted to acting bridge engineer, a position he held until April, 1919, when he became bridge engineer of the Canadian National, with supervision also over the bridge of the Canadian Northern, which

was absorbed at that time. He retained this position until August, 1920, when he was appointed assistant bridge engineer of the amalgamated Canadian Northern and Grand Trunk lines, which position he held until his recent promotion again to bridge engineer.

### Obituary

**A. J. Canny**, supervisor of track on the Pennsylvania, with headquarters at Xenia, Ohio, has died.

**William P. Jones**, resident engineer for the Colorado & Southern at the time of the construction of the "Georgetown Loop" in Colorado, died at Louisville, Ky., on September 25.

**J. H. Patton**, assistant division engineer of the Union Pacific, with headquarters at Salt Lake City, Utah, was killed while riding a small railway motor car near Medicine Bow, Wyo., on October 11.

**Michael Rowan**, for 20 years a roadmaster on the Mississippi Central, with headquarters at Hattiesburg, Miss., died in that city on October 11 at the age of 62. Mr. Rowan claimed the distinction of laying the first rail on the New Orleans & Northeastern, with which he was a roadmaster for 18 years prior to his becoming roadmaster on the Mississippi Central.

**Alexander Gibson**, master carpenter on the Aurora and Chicago divisions of the Chicago, Burlington & Quincy, died on September 29, at Aurora. Mr. Gibson was born on January 1, 1863, in Wigtonshire, Scotland, and emigrated to this country in 1881. He entered railway service in 1882 as a carpenter in the Aurora shops of the Chicago, Burlington & Quincy, and remained there until 1888, when he entered the employ of the Pullman Company, at Pullman, Ill. He returned to the Chicago, Burlington & Quincy in 1892, as a foreman in the building department and continued as such until 1905, when he became master carpenter of the Aurora division, holding this position, enlarged in 1910 to include the Chicago division, until his death.

**James A. McCrea**, vice-president in charge of the Central region of the Pennsylvania railroad system, with headquarters at Pittsburgh, Pa., and formerly in the engineering department, died on October 17 at Pittsburgh, from pneumonia. Colonel McCrea was born on May 26, 1875, at Philadelphia, and after completing his education at Yale University he entered the Pennsylvania in 1895 at Pittsburgh as rodman in the office of the chief engineer of the Lines West. A year later he was transferred to the maintenance of way department of the Cleveland and Pittsburgh division, and in May, 1897, was transferred to the Philadelphia division. In May, 1898, he became assistant engineer of maintenance of way and in August of the following year engineer of maintenance of way of the Lines East. In June, 1901, he returned to the Western lines, where he was promoted to superintendent of the Cincinnati division. Thereafter he served as general superintendent and general manager on the Long Island until 1917, when he joined the military staff of General Atterbury. Following the war he was vice-president of the Bankers Trust Company, New York City, until 1920, when he returned to the Pennsylvania as vice-president in charge of the Central region, where he was serving at the time of his death. Colonel McCrea was possessor of the Distinguished Service Medal of the United States and was made an officer of the Legion of Honor by France. He was a son of the late James McCrea, who was president of the Pennsylvania from 1907 to 1913.



James A. McCrea

## Construction News

The American Niagara Railroad Corporation has been authorized to build a line from a connection with the New York Central at Tonawanda, N. Y., across the east branch of the Niagara river and Chippewa Channel to a point on the International boundary. Another company, the Canadian Niagara Bridge Company, has obtained authority in Canada to continue the line to a point on the Michigan Central near Welland, Can., the two lines to form a new connection between railroads on the American and Canadian sides of the Niagara river. The company is controlled by the New York Central and the Canadian Pacific.

The Atchison, Topeka & Santa Fe has awarded a contract to Robert E. McKee, El Paso, Tex., for the construction of a new pipe and tin working shop at San Bernardino, Cal., reported in the September issue.

The Atlantic Coast Line has awarded a contract to Roberts & Schaefer Company, Chicago, for the construction of a 500-ton, three track, automatic electric coaling station at Wacross, Ga.

The Baltimore & Ohio plans the construction of an eight-story ice and cold storage plant at Toledo, Ohio, at a cost of over \$2,000,000.

This company has been given authority jointly with the Pittsburgh, Cincinnati, Chicago & St. Louis to elevate tracks over Garfield boulevard in Chicago.

The Canadian National contemplates the construction of a branch from Brule, Alta., to Grand Prairie, to give access to new coal fields and the wheat belt in the Peace river region.

The Chicago & Eastern Illinois has awarded a contract to Bairnsfather Construction Company, Salem, Ill., for the construction of a passenger station at Johnston City, Ill., at an approximate cost of \$20,000.

The Chesapeake & Ohio has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of water treating plants at Moorehead, Ky., Olive Hill, Hurricane, W. Va., and Troul.

This company contemplates the construction of a passenger station at Ashland, Ky., at a cost of approximately \$300,000; additions to the freight station, extension of yard track and terminal facilities and the realignment of the main line track to the new terminal. The total project is to cost \$2,250,000.

The Chicago, Burlington & Quincy, jointly with the Colorado & Southern, contemplates the construction of a new passenger station at Longmont, Colo., where the old Burlington passenger station is to be used as a joint freight office. This company closed bids on October 17 for the concrete foundation of the Union Station at Davenport, Iowa.

This company plans the construction of a new freight yard at Willows, Ill., about 2½ miles east of Bridge Junction, East St. Louis, at an estimated cost of \$700,000, the yard to have a capacity of 1,100 cars and to cover approximately 90 acres of land, which is being purchased.

The Chicago Great Western closed bids on October 11 for the construction of a four-stall addition to its roundhouse at Ft. Dodge, Iowa.

The Chicago, Rock Island & Pacific has awarded a contract to the Roberts & Schaefer Company, Chicago, for the erection of a 200-ton automatic electric coaling station of frame construction at Hutchinson, Kan.

The Elgin, Joliet & Eastern will soon call for bids for the construction of a subway under its tracks at Bluff road, Joliet, Ill., to cost approximately \$130,000.

The Ft. Wayne Union has petitioned for a franchise for the construction and operation of a double-track railway to serve the Fort Wayne plant of the International Harvester Company and other industries in that city and to form belt line connections with other Fort Wayne railroads.

The Illinois Central has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a water treating plant and pumping facilities at Pound River, Ky.

This company will construct a new passenger station at Hazlehurst, Miss., at a cost of approximately \$45,000.

This company has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 3-track reinforced concrete electric coaling station at Council Bluffs, Iowa, and a 15,000-ton drag scraper ground coal storage installation in connection with the coaling plant.

The Jacksonville Terminal has awarded a contract to the Roberts & Schaefer Company, Chicago, for the installation of a cinder handling plant at Jacksonville, Fla.

The Kansas City & Grandview has been authorized to build a 13.48-mile line from Kansas City to Grandview, Mo.

The Louisville & Nashville will construct a freight station at Covington, Ky., to cost approximately \$120,000.

The Missouri Pacific closed bids on October 22 for the construction of a one-story brick passenger station, with a tile roof, 24 ft. by 160 ft., at Bald Knob, Ark., will construct an addition to the passenger station at Wagoner, Okla., to cost approximately \$11,500, and has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a passenger station at Crane, Mo.

The New York, Chicago & St. Louis is preparing plans for the double tracking of its line between Buffalo, N. Y., and Chicago, to be completed within three or four years.

An ordinance calling for the elevation of this company's tracks at 11 street crossings in Fort Wayne, Ind., is being prepared by the Board of Public Works.

The Pennsylvania has awarded a contract to Herman Tapp, Fort Wayne, Ind., for work amounting to \$70,000 in connection with track elevation work at the Henna and Lafayette street crossings of the Pennsylvania and the Wabash railways at Fort Wayne, Ind.

The Pere Marquette has awarded a contract to the Roberts & Schaefer Company, Chicago, for the construction of a 300-ton, 3-track, reinforced concrete electric coaling station at Erie, Mich.

The Public Belt, owned by the Harris County Houston Ship Channel Navigation District, has awarded a contract to List & Gifford, Dallas, Tex., for the construction of a car classification yard at Houston, Tex., to cost \$120,000.

The St. Louis-San Francisco contemplates the construction of a new passenger station at Enid, Okla.

The St. Louis-San Francisco closed bids on October 12 for the construction of a one-story brick mail and express building, 40 ft. by 326 ft. at Springfield, Mo.

The Southern Pacific is preparing plans for the construction of a new station at Redlands, Cal., and has been ordered by the Railroad Commission of California to prepare detailed plans for a passenger station at Sacramento, Cal., within 90 days.

The Terre Haute, Indianapolis & Eastern (Electric) is preparing plans for the construction of new car barns and shops at Richmond, Ind., to cost \$50,000.

The Toledo, St. Louis & Western has awarded a contract to Bierd, Lydon & Grand Pre, Chicago, for the construction of a 27-stall engine house and other engine terminal facilities at Frankford, Ind., to cost approximately \$300,000.

The Union Pacific has awarded a contract to the Graver Corporation, East Chicago, Ind., for the erection of two 10,000 gal. per hour water softening plants at Fossil, Wyo., and Arden, Nev.

This company has closed bids for the construction of a new passenger station at Laramie, Wyo., to cost approximately \$175,000, reported in the October issue, and will proceed with the excavation work within the next 30 days.

The number of freight cars loaded with revenue freight October, fell slightly below the record breaking figure of October, fell slightly below the record breaking figure of the two weeks before, but the total 1,084,458 cars represented an increase of 114,971 cars, as compared with the corresponding week of last year, and of 173,929 cars, as compared with 1921. All classes of commodities showed increases for the week over the corresponding week of last year, except the loading of coke and ore.

## Supply Trade News

### General

The American Steel & Wire Company has purchased 130 acres of land at Gary, Ind., on which it will construct a new plant.

The McMyler Interstate Company, Cleveland, Ohio, has removed its New York City office from 50 Church street to the Woolworth Building, 253 Broadway.

The Kilbourne & Jacobs Manufacturing Company's property has been sold at public auction to R. Huntington, of the Huntington National Bank, Columbus, Ohio.

The Blaw-Knox Company, Pittsburgh, Pa., has opened a branch office at 622 Genesee Bldg., Buffalo, N. Y., pursuant to which J. C. McCuide has been transferred from Pittsburgh as manager of the Buffalo office.

The Roberts & Schaefer Company, Chicago, has been awarded a contract by the South Australian Railways for the construction of nine reinforced concrete and steel coaling stations, the largest to be of 300-tons capacity and to include sand handling facilities.

The Selflock Nut & Bolt Co., Inc., East Syracuse, N. Y., manufacturers of friction fit nuts and bolts, has entered into a contract with the Bethlehem Steel Company, Bethlehem, Pa., operative at once, for the manufacture and sale of carriage and machine bolts, track bolts and heavy railway nuts and bolts. The Selflock Company will increase its own facilities and specialize on S. A. E. Selflock products, as well as cap screws with Selflock threads.

The Industrial Works, Bay City, Mich., celebrated its 50th anniversary on October 10, at Bay City. The celebration included a sales conference of representatives of the Industrial Works from all principal points of the United States, Canada, Cuba and South America, during which conference a test was made of a 200-ton industrial crane which has been built for the Norfolk & Western. At the banquet addresses were made by William L. Clements, president; C. R. Wells, secretary and treasurer, and Ernest C. Perry, general manager.

The Railroad Equipment and Supply Exchange, Inc., Chicago, which was organized for the purpose of constructing a building which will house all railroad equipment and supply concerns located in Chicago in one building with club facilities, an auditorium and adequate space for offices and display rooms, has completed a survey of the railway supply business in Chicago and has made a report covering 500 concerns. This report shows that these concerns are scattered about the city in more than 60 different buildings and localities and occupy a total of 973,205 sq. ft. of space, for which they pay an annual rental of \$3,649,618. From the survey it is estimated that this yearly rental can be reduced to \$1,730,108 for the same amount of space, thereby affording a saving of \$1,946,510 per year.

### Personal

E. H. Batchelder, Jr., has been appointed special representative of the Lundie Engineering Corporation, New York, with headquarters at Chicago.

Robert D. Black, branch manager of the Black & Decker Manufacturing Company, has been appointed advertising manager, effective January 1, 1924.

M. C. Nelson, vice-president and general sales manager of the Long Bell Lumber Company, has been elected president to succeed F. J. Bannister, resigned after 31 years of service.

Albert S. Boisfontaine, assistant to the manager of the Southern Pine Association, New Orleans, La., since last June, has been appointed assistant secretary. Mr. Boisfontaine has been serving in a number of capacities with the association since 1917.

The Clark Car Company, of Pittsburgh, Pa., has appointed B. K. Mould eastern manager, with headquarters at 2107

Woolworth building, New York City. Mr. Mould formerly spent thirteen years with the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pa., and later several years as eastern sales manager, condenser department of the Elliott Company, Jeannette, Pa.

**Grant Smith**, founder of Grant Smith & Company, died in St. Paul in October at the age of 59 years. He was born at Portage, Wis., in 1864 and entered contracting work about 20 years later, shortly thereafter forming an association with E. D. and W. E. Hauser, which resulted in the formation of the Grant Smith Company. Throughout his career Mr. Smith had permanently associated himself with railroad projects, chiefly in the northwest, where the company undertook the revision of the shore line of the Great Northern into Seattle, and the building of 70 miles of the Spokane, Portland & Seattle. At the present time the company is building the extension on the Timiskaming & Northern Ontario to James Bay, Canada. Throughout his entire career Mr. Smith is known to have spent the major portion of his time in personal contact with the various undertakings of the company throughout this country and Canada. During the war, Grant Smith & Company built the first wooden ships for the government.

### Trade Publications

**Steam Shovels.**—The Osgood Shovel Company, Marion, Ohio, has issued a leaflet illustrating and describing its new 1¼-yard steam shovel. The description is supplemented by halftone illustrations showing various details of the construction both of the truck and the hoisting mechanism, and illustrations also of the machine in service in clam hell and drag line work.

**Cinder Handling Plant.**—In a four-page folder recently issued by Roberts & Schaefer Company, Chicago, illustrations and descriptive matter are presented with regard to the N. & W. type cinder handling plant built by that company. This equipment consists essentially of a bucket ascending from a shallow track pit up an incline to a dumping point above an adjoining track provided for the spotting of gondola or hopper cars.

**Gas Welding and Cutting Equipment.**—In a 40-page catalog recently issued by the Torchwelt Equipment Company, Chicago, complete information is afforded concerning the complete line of equipment manufactured by that company including such items as oxy-acetylene welding and cutting apparatus, lead welding, soldering, brazing and decarbonizing units, gas pressure regulators, automatic machines, generators and supplies. The catalog is illustrated with wash drawings of the various types of equipment described.

**Zinc Roofing.**—New leaflets have been issued by the New Jersey Zinc Company devoted to the consideration of its standing seam Horsehead zinc roofing. One of the leaflets is entirely devoted to instructions as to laying this type of roofing under various conditions. These instructions are supplemented by illustrations showing various stages of the progressive steps of forming the roofing seams and the details of the construction of such seams in the various parts of the roof.

**Paint Sprayers.**—A new folder has been issued by the Paache Air Brush Company, Chicago, illustrating and describing its line of portable painting and air conditioning outfits. Each of the several types of outfits are illustrated and discussed with reference to their adaptability for certain kinds of work and the method of their use. The leaflet devotes considerable attention also to a description of the air brushes manufactured by the company with the supplementary equipment for doing interior decoration and finishing work.

**Thermit Rail Welding.**—The Metal & Thermit Corporation, New York, has recently issued a 72-page, illustrated pamphlet devoted to recent improvements in thermit rail welding. The text includes detailed instructions, accompanied by illustrations, for the making of rail welds by the improved method. The apparatus used in conjunction with rail welding as, for instance, a self-luting mold box and a light-weight double-burner preheater, are described in detail. Other instructions are included covering the use of thermit

for welding compromise joints, constructing frogs and crossings and for repairing switches. In addition to the above, the pamphlet contains data on rail bending and drop tests, as well as a discussion of the theory of rail joints.

**Insulation.**—"Everything in Insulation" is the title of a 60-page booklet issued by the Mitchell-Rand Manufacturing Company, New York City, for use particularly where protection to electrical equipment is under consideration. Adhesive asbestos products, carbon materials, fabrics, varnishes, and other finishing or sealing compounds, waterproofing compound for structural or wall work, roofing cement, fiber products, insulating paints for waterproofing and acidproofing, and friction tape are prominent among the subjects listed. It is the plan throughout the book to outline the scope of use for each product as well as to describe it and, in many cases, instructions are furnished as to the proper method of application. The book is illustrated and contains various tables for the use of the electrician.

**Waterproofing.**—The General Fireproofing Company, Youngstown, Ohio, has issued the sixth edition of a waterproofing handbook which is a 72-page, loose-leaf, letter size booklet. It is attractively illustrated by photographs of recent construction projects upon which the G.-F. waterproofing materials are used, and for the convenience of the reader, is divided into four sections as follows: Section 1—Substructural Waterproofing, devoted to the methods and materials for the waterproofing of foundations, basements, pits, tanks, pools, containers, and other structures subjected to hydrostatic pressure or dampness. Section 2—Superstructural Waterproofing, devoted to methods and materials for rendering walls, and roofs proof against weathering and dampness, for the stainproofing of cut stone, for the preservation and beautifying of stucco brick and concrete walls, and for filling expansion joints. Section 3—Cement and Wood Floor Preservation, devoted to methods and materials for hardening, dustproofing, decorating and waterproofing cement and wood floors and for accelerating the setting and preventing the freezing of newly laid cement floors. Section 4—Technical Paints and Coatings, devoted to the methods and materials for rendering walls, floors and containers proof against acids and oils, for protecting structural steel and galvanized surfaces from rust and timbers from dry rot and decay, for bonding new concrete to walls, for waterproofing and hardening cut stone and cement blocks and for stainproofing limestone. Each section opens with a specification guide which tabulates various methods suited to each problem and gives an index of the product to be used with each method. This specification guide is then followed successively by a description of each method, with full instructions concerning procedure, followed in turn by a description of the various products.

### Equipment and Supplies

**The Baltimore & Ohio** has placed orders for 50,000 tons of steel rail, to be delivered during 1924, as follows: Carnegie Steel Company, 25,000 tons; Illinois Steel Company, 4,000 tons; Cambria Steel Company, 10,000 tons; Inland Steel Company, 3,000 tons; and Bethlehem Steel Company, 8,000 tons. All of the above is for 100-lb. rail except 5,000 tons of 130-lb. Orders were also placed with the Inland Steel Company for 2,000 tons of rail for the Baltimore & Ohio Chicago Terminal Railroad, at Chicago.

**The Chesapeake & Ohio** has given contracts for supplying a total of 30,000 tons of new rail during the first six months of 1924, to the Illinois Steel Company, the Inland Steel Company and the Bethlehem Steel Company.

**The Florida East Coast, Alabama & Vicksburg, and Atlanta, Birmingham & Atlantic** have ordered 5,500 tons of rail, 4,500 tons, and 2,000 tons, respectively, from the United States Steel Corporation interests.

**The Hocking Valley** has awarded a contract for 5,400 tons of new rail to the Carnegie Steel Company for delivery during April and May, 1924.

**The New York Central** has placed orders for a total of about 450 tons of structural steel for bridges. The Bethlehem Steel Bridge Company has orders for 250 tons.

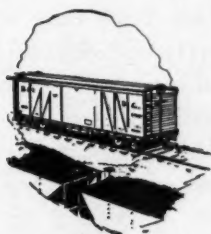
## RUST-PROOFING WITH PICHER SUBLIMED BLUE LEAD

## Can Steel be Rust-proofed at less cost? —a Problem of Railroad Management

THE shopping of steel cars because of impairment by rust . . . The reconstruction of steel bridges, trestles, water-tanks and other railroad structures, weakened by the inroads of rust . . . The determination of adequate methods of rust-prevention . . . The reduction of really efficient metal protection to minimum cost.

These are problems of large importance to the management of every railroad.

That is why every railroad man responsible for the maintenance of railroad property should know these facts about PICHER Sublimed Blue Lead in Oil.



1. A six-year test of more than fifty paints proved PICHER Sublimed Blue Lead in Oil to be the most

effective commercial rust-proofing paint known. This test was conducted by the American Society for Testing Materials and was, therefore, impartial and authoritative.

2. PICHER Sublimed Blue Lead in Oil is relatively moderate in first cost.
3. PICHER Sublimed Blue Lead in Oil is economical of labor.
4. The natural color of PICHER Sublimed Blue Lead in Oil is slate-gray—the most desirable color for most railroad structures requiring a rust-proofing paint.

For further details write for booklet — “*Rust-proofing with Sublimed Blue Lead.*”

### The EAGLE-PICHER LEAD COMPANY

208 SOUTH LA SALLE STREET, CHICAGO



Cincinnati New York Philadelphia Pittsburgh Minneapolis Kansas City Cleveland Baltimore St. Louis Buffalo Detroit Joplin New Orleans

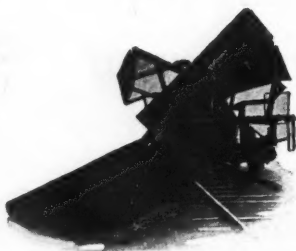
# Picher Sublimed Blue Lead in Oil

90% of PURE blue lead ground in 10% of PURE raw linseed oil



6-3128-28

# This Railroad Bought *Westerns*



**Western Air Dump Car  
with Apron**

Can be attached to any  
Western automatic air  
dump car, new or old.



**That's Why**

"——and if we had depended on the blue-prints alone," said the railroad superintendent, "we should have bought the other air dump car, but we visited a job where both cars were in active service and the superiority of the *Western* car no longer could be doubted. Strange to say, the features of the other car which we thought superior to the Western design in the blue-print turned out to be decidedly inferior in actual service."

Western dump cars will **OUTWORK** and **OUTWEAR** any other dump car in the market. Send for specifications and information in detail.

## WESTERN WHEELED SCRAPER COMPANY

*Earth and Stone Handling Equipment*

AURORA, ILLINOIS

# DIG

### A Prominent Pittsburgh Contractor Says:

"With reference to a couple of Dreadnaught Buckets which we bought from you about a year and a half ago, we wish to say that one of these buckets has seen continuous service for at least seven months and during this time we have had no trouble and no repairs whatsoever.

We found that it will handle material which is hard to dig with an Orange Peel Bucket, at least twice as fast, thereby decreasing the cost for excavating such material. So far we have not found any material, except rock, which we could not dig with the bucket.

What we like in particular about the bucket is the fact that it does not have to be straightened out like an Orange Peel Bucket, which is the only bucket this Company used heretofore in extremely heavy digging.

We are very well pleased with the performance of this bucket and would recommend it to anybody."

### Excavate with a Powerful DIGGING DREADNAUGHT

#### Chew off big bucket loads

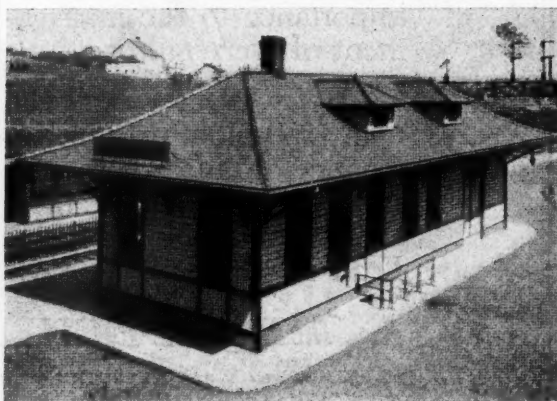
The Blaw-Knox DREADNAUGHT has well shaped digging scoops—with tremendous lever arm power behind them for forcing through packed broken stone, bank gravel, clay and other hard packed materials—heaping up big loads in any material which can be "clammed" at all. Built by master builders to stand the gaff of hard continuous digging—a Blaw-Knox Dreadnaught Bucket lasts. Rope wear and bucket wear are reduced to a minimum.

**BLAW-KNOX COMPANY**  
639 Farmer's Bank Bldg., Pittsburgh, Pa.

BLAW-KNOX  
PRODUCTS  
STEEL PILING  
STEEL RAILS  
STEEL BOLTS  
STEEL WIRE  
STEEL CABLES  
STEEL CHAINS  
STEEL ROPES  
STEEL BELLS  
STEEL LUGS  
STEEL PINS  
STEEL WEDGES  
STEEL SHIMS  
STEEL PLATES  
STEEL ANGLES  
STEEL BEAMS  
STEEL CHANNELS  
STEEL TUBES  
STEEL PIPES  
STEEL FITTINGS  
STEEL VALVES  
STEEL GATES  
STEEL BRACKETS  
STEEL CLAMPS  
STEEL HOLES  
STEEL BOLTS  
STEEL NUTS  
STEEL WASHERS  
STEEL SPACERS  
STEEL BRACES  
STEEL RIVETS  
STEEL SCREWS  
STEEL DRILL BITS  
STEEL DRILL RODS  
STEEL DRILL COCKS  
STEEL DRILL CHUCKS  
STEEL DRILL COLLARS  
STEEL DRILL GUIDES  
STEEL DRILL JAWS  
STEEL DRILL POINTS  
STEEL DRILL TUBES  
STEEL DRILL WELLS  
STEEL DRILL HOLES  
STEEL DRILL CAVES  
STEEL DRILL SHAFTS  
STEEL DRILL TUNNELS  
STEEL DRILL MINES  
STEEL DRILL QUARRIES  
STEEL DRILL FACTORIES  
STEEL DRILL OFFICES  
STEEL DRILL HOMES  
STEEL DRILL SCHOOLS  
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STEEL DRILL CITIES  
STEEL DRILL COUNTRIES  
STEEL DRILL WORLD



# BLAW-KNOX BUCKETS



## MAINTENANCE THRIFT

Appearance of stations is not to be ignored. **IMPROVED O. G. FIR GUTTERS**, once placed, are brought to mind only by the neat appearance.

Metal gutters are subject to heat expansion and corrosive action of smoke and cinder deposits. Use



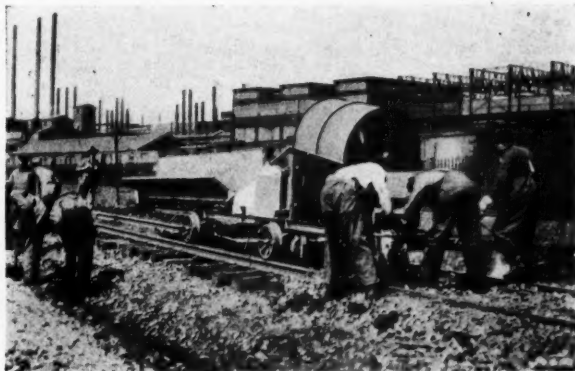
# GUTTERS

Described in our Maintenance Cyclopedia

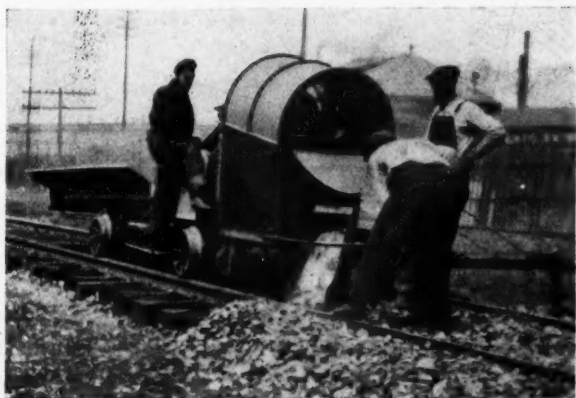
**E. M. LONG & SONS, CADIZ, OHIO**

# THE POWER BALLAST SCREEN

This is the machine reported upon by the Metropolitan Track Supervisor's Club as capable of cleaning rock ballast more economically than any other method known.



Showing machine in operation, screening more than **ONE YARD PER MAN PER HOUR** for the full gang of eighteen men.



Showing the finished job of **CLEAN BALLAST PROPERLY DISTRIBUTED ON TRACK** by means of swiveling rock spout—distribution being thoroughly accomplished by two men.



Showing **LARGE QUANTITIES** of dirt necessary at times to be removed from ballast—in this case amounting to **FULLY FORTY PER CENT** of material passed through machine.

*For Further Information Address*

**THE MAINTENANCE EQUIPMENT CO.**

LABOR SAVING DEVICES

RAILWAY EXCHANGE, 80 E. Jackson Boulevard,

CHICAGO

# Pipe Lines from B.B. Forman



B.B. Jr.:

We got the usual fall traffic jam and we don't dare touch a bridge, so the old man had four of us in for what he calls a "conference" last week. We mostly talked plans for next summer's work. First off, we tackled a set of "instructions" for laying Concrete Culvert Pipe. It was some job putting down everything just right but I think we finally got most everything about the way I been telling you.

A couple of things that we wrote down might maybe be new to you. One was like this: When laying pipe where new ~~excavation~~ fill is to be dumped, as in filling an old trestle, the pipe should be crowned to allow for settlement of the fill.

The other one the old man put in and he says it's important. It was this: When laying double lines, the pipe should be at least one diameter apart to allow the fill to build up the lateral support.

So you start as Supervisor next month. Well, say that's one rung up the ladder but don't let that stop you long. With all those new pipes in place you won't have much to do in a maintenance job. Use all your spare time getting ready for something better and I wouldn't be surprised to hear from you in a div engs office in another year.

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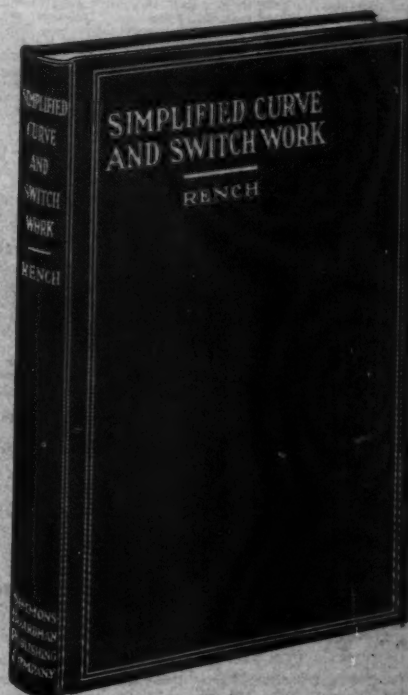
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### TRACK SECTION

The stone is thrown from the belt into ballast boxes down which it falls and is separated more effectively from the dirt, or it is conveyed or conveyed



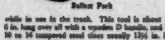
Ballast Crusher  
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by power to the screen of portable crushing machine. Sometimes a car load with, adjustable wheel rollers on each side to feed up the top ballast on the shoulders outside the ends of the line.

**BALLAST CRUSHER.** A machine designed to crush or re-crush stone and ballast to clean suitable for ballasting tracks. Estimates each crushing stone commonly have large crushers for producing 4 in. to 8 in. sizes from large rock or ballast, and smaller machines to crush this material to particle ranging from 1/4 in. to 3/8 in. in size suitable for ballast. See Ballast Crusher (General Section).

**BALLAST, DISINTEGRATED ROCK.** A natural deposit of fragmentary rock, usually granite, but sometimes a specific formation which is quarried and used as ballast in a few ballast on some American and foreign railways. It breaks to pieces convenient for ballast when placed to house it from its bed or is easily broken along lines of natural cleavage in the proper sizes. The particles are hard, heavy, sharp and difficult to handle as ballast, but wash, drain and hold track well.

**BALLAST PILE.** A road shoulder to a grading bank, but with a wider spread of more and longer stones, designed for handling crushed stone and for draining crushed stone ballast of dirt accumulated



Ballast Pile  
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which are square in section, tapering toward the top and held in place by a steel diameter which curves upward at each side to retain the ball of the top of the stone above the knuckle, which is fixed to the top of a long steel bar. The knuckle is turned, the stone, ballast or rock the ballast, are usually about 1 in. to 1 1/4 in. wide.

**BALLAST, GRAVEL.** Waste fragments of rock, (according to railroad department) that will pass through a 3/4 in. ring and be retained on a 1/4 in. 10 screen. (A, B, C, D.)

This ballast is valued above all kinds except crushed rock. It is usually composed of hard particles were crushed and round by glacial pressure, being subject to rock only because its rounded particles do not bind together as readily as the sharp edged stones.

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Typical Gravel Ballast Track

glacial beds, sometimes in high ridges several miles in length, but also in smaller beds underlying level ground. It varies commonly in stone shape ranging from layers of sand and ballast with which material is in smaller sizes or in stone. Typical gravel ballast is fine from clay and loam, but may contain from 20 per cent to 50 per cent of clean sand, mixed with gravel particles which will pass a 3/4 in. ring. Coarser particles and ballast are less objectionable than an excess of sand or the presence of clay or loam, but ballast may be sorted out, cleaned or crushed for ballast or for other maintenance purposes. Desirable gravel ballast pit not those which are convenient to the track to be ballasted, easily drained, of sufficient depth to enable the material to be loaded by crane derrick or other equipment and of sufficient area to warrant the installation of elaborate storage, sorting and repacking of reliable character, as well as room for the disposal of rejecting and ballast. For economical operation by crane derrick the material should be placed on the surface in level areas not less than 4 ft. deep.

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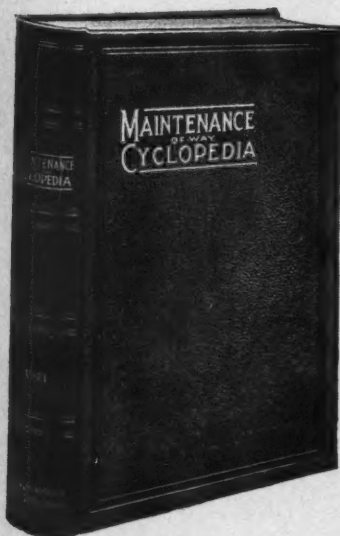
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K. E. KELLENBERGER (Signal Section), Editor of the *Railway Signal Engineer*

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*We are always glad to prepare exact specifications for any standard or unusual use or condition. Simply state the problem and we will give prompt attention.*

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MANUFACTURERS ASSOCIATION**  
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**FOR PAVEMENTS THAT OUTLAST THE BONDS**

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### High Duty, Self Propelling STEAM PILE DRIVER

Designed especially for  
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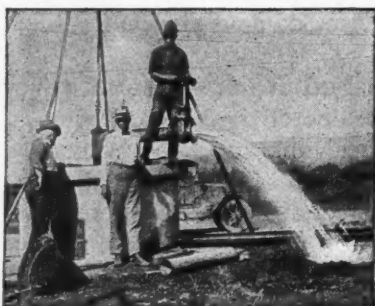
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How much is your water supply curtailed by sand or mud accumulations? Do your pumps wear out or require frequent cleaning from this cause? A SULLIVAN AIR LIFT and properly applied "Back Blowing" will remove sand and mud troubles and permanently increase the flow from your wells.

This cut shows a well in Utah being "back blown" as described. The flow of water was more than doubled by this process. If you have a well pumping problem ask for Bulletin 1971-G.

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SENECA FALLS, N. Y.

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# How many of your water columns are knocked down every year?

What does the repairs and maintenance—not the result of ordinary use—cost you?

Avoid this annoyance, trouble and expense by using a

How lateral movement of spout prevents column being knocked down

## POAGE Style "H" WATER COLUMN with FENNER DROP SPOUT

The three foot lateral range in the Fenner spout and the steel riser in the Poage Style H save the water column from being knocked down by the shifting of the tender.

The tender has to leave the track to knock this column down.

The flexible spout makes it unnecessary to spot the tender accurately. You save time by quick adjustment.

The five foot up and down range enables the water column to fill a tender of any height.

Manufactured Exclusively By

**The American Valve & Meter Co.**

Cincinnati, Ohio



The open telescopic joint does not waste a drop of water. It banishes the usual winter time troubles. Ice does not collect upon it.

The valve permits the maximum amount of water to flow in the shortest time. There is a minimum of frictional resistance. It shuts the water off quick without water hammer.

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Scale-forming feed water increases coal consumption, necessitates repairs to boiler tubes, staybolts, and fireboxes, increases the expense of dead-head locomotive mileage, and requires that money be tied up in extra locomotives to replace those sent to the shop for repairs, due to the use of hard water.

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*Specialists for twenty years in railroad*  
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## MURDOCK "SAFETY FIRST" RAILWAY WATER SERVICE BOX

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Either Full On or Completely Off**

**No Leakage No Waste  
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**Nothing to Stumble Over**

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**DRINKING FOUNTAINS**  
Fool-proof, for Shops, Stations, Offices

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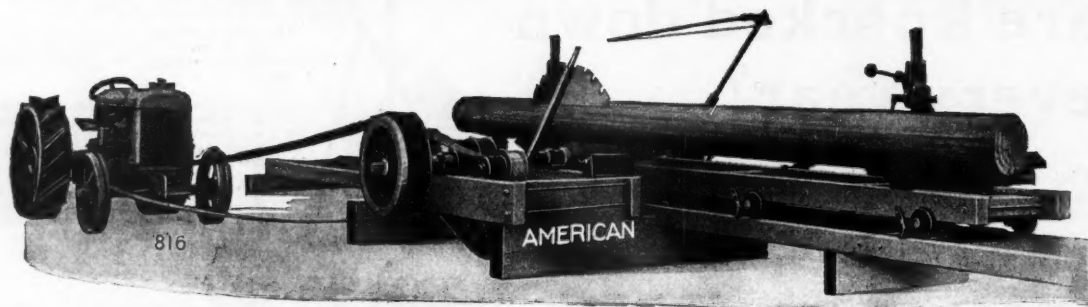
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**CINCINNATI, OHIO.**

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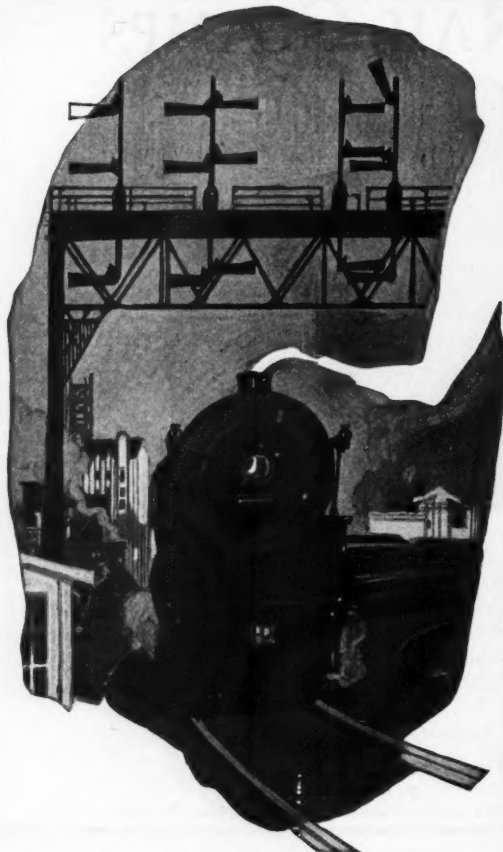
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STATEMENT of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of *Railway Engineering and Maintenance*, published monthly at Chicago, Ill., for October 1, 1923.

State of New York, } ss.  
County of New York }

Before me, a notary public in and for the State and County aforesaid, personally appeared Henry Lee, who, having been duly sworn according to law, deposes and says that he is the Vice-President of *Railway Engineering and Maintenance*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Simmons-Boardman Publishing Company, 30 Church Street, New York, N. Y.

Editor, Elmer T. Howson, 608 South Dearborn Street, Chicago, Ill.

Managing Editor, Walter S. Lacher, 608 South Dearborn Street, Chicago, Ill.

Business Manager, F. C. Koch, 30 Church Street, New York N. Y.

2. That the owners are:

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities, are: There are none.

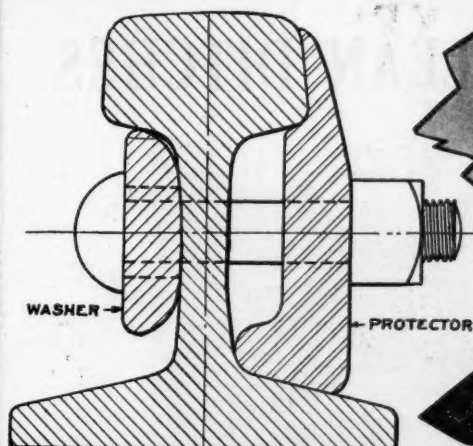
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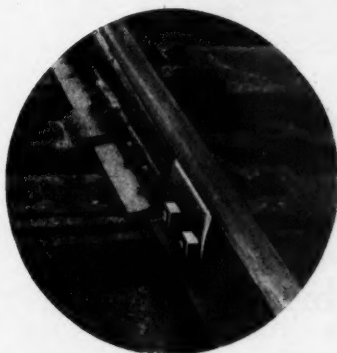
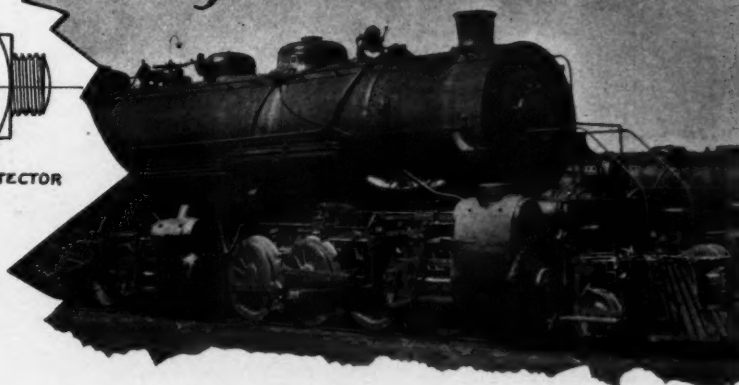
[SEAL]

Sworn to and subscribed before me this 26th day of September, 1923.

HERBERT E. McCANDLESS.  
(My commission expires March 30, 1924.)



*What switch points face today and~*



### The Mack Switch Points Protector

**S**WITCH points are facing today the heaviest locomotive and car equipment in railroad history. Their repair and replacement has long been the most costly item of ways maintenance.

Protecting switch points by the Mack Protectors adds no less than ten times the life of the unprotected point, it greatly reduces the possibility of derailment at switches.

Installation can be made easily at small cost—replacements are made in from five to ten minutes by one man—their efficiency is not impaired by any weather conditions—sure—economical—inexpensive.

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Osgood Heavy Duty Ditchers Cleaning Ballast

### LABOR and MODERN MACHINERY

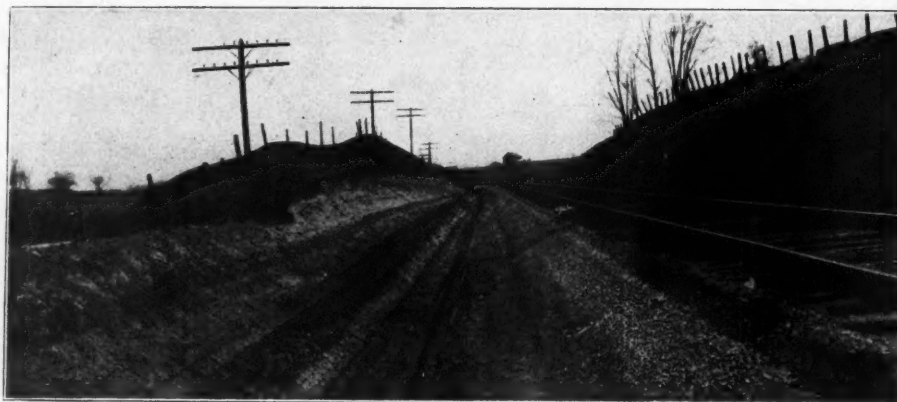
Much is being said about the shortage of labor. This shortage may become acute, but modern mechanical equipment will take the place of many laborers and help much to relieve the situation. OSGOOD RAILROAD DITCHERS will do the work of an entire labor gang, and won't lay off.

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$\frac{3}{4}$  and 1-Yd. Railroad Ditchers  
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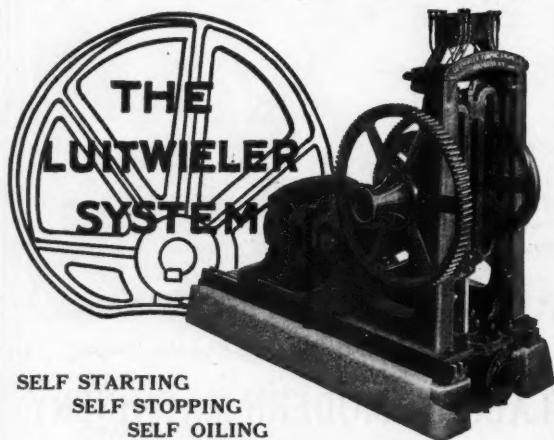


The Jordan is an all-the-year-'round machine.  
It spreads, makes ditches, cuts ice, fights snow.

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Reciprocating CAMS and Balanced Parts are the  
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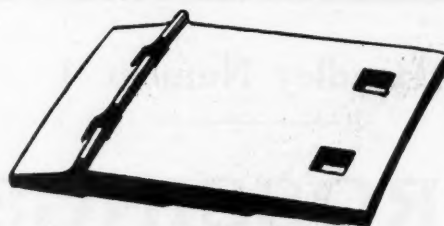
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Flow Deep Well Pumps**

Nationally known RAILROADS have made astounding  
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Luitwieler Pumps are adapted to all deep well and  
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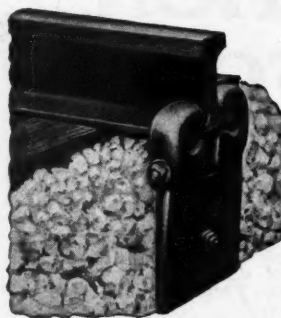
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Will give rail and wheels longer life.  
Will hold gauge and not injure a single fibre of the tie.  
Will not rattle.



**The Lundie  
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Requires only one  
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Will hold in both  
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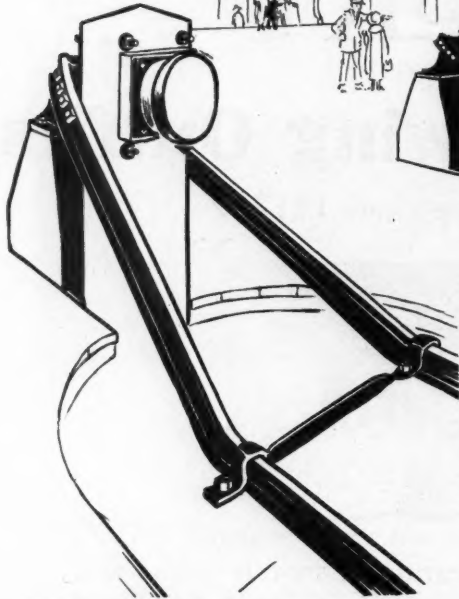
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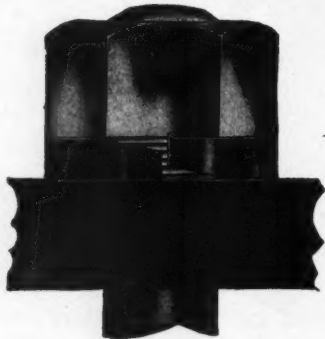


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Positive Lock Washers are so constructed that the "body" of the washer carries the load of compression and the tapered ends are thus relieved, and the spring is constant. The Barbs, being free, force themselves deeply into the nut and plate under vibration.

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Will operate extension lights and cutting torches.

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Re-charging—easy and clean work.

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No. 45 Road Oil adheres to the metal, giving maximum protection and outlasts the cheaper and unsuitable products, which must be applied oftener than No. 45 Road Oil. Therefore, the labor cost of application is less with No. 45 Road Oil.

Thirteen months after the application of No. 45 Road Oil to the rails on his road, the President of the road writes:

"A recent inspection of the rail which was sprayed with oil some time ago shows that the oil is still adhering to the metal in good shape and that there is a good coating of oil on the metal."

A General Manager stated that spraying the rails on his road had prolonged their life ten years.

Why not secure the greater protection and reduced labor costs in this work by using Texaco No. 45 Road Oil.

A booklet

"Reducing Costs of Roadway Maintenance"  
sent to you for the asking.



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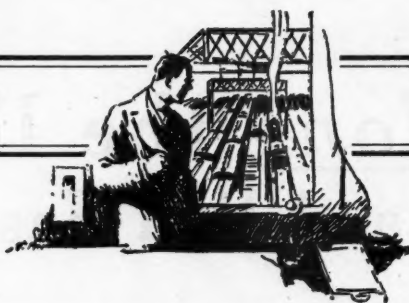
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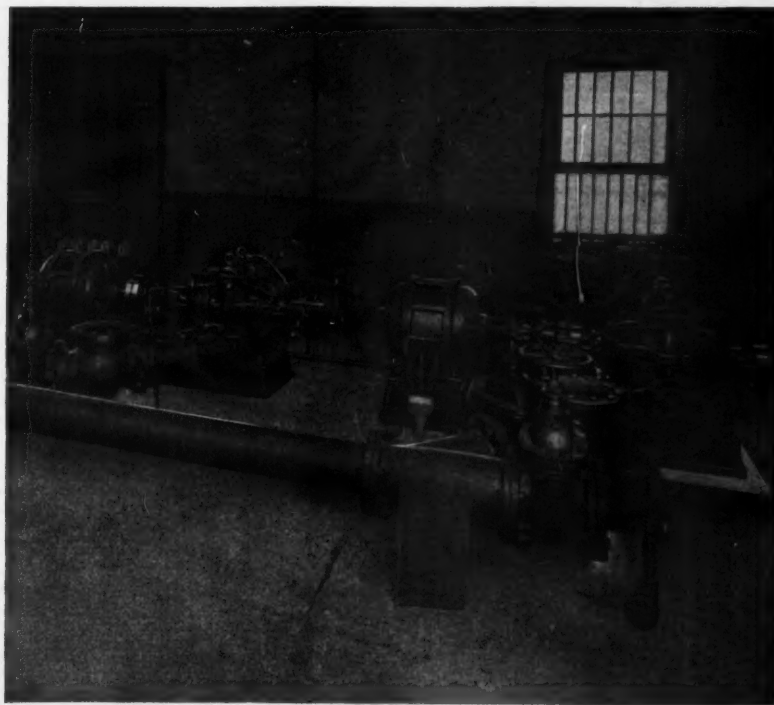
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Guide

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